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Lamme Award—Hardy Cross

To Hardy Cross for his development of revolutionary methods of analysis in structural engineering; for his application of these methods to the rigorous training of civil engineers; for his insistence on the great responsibilities of the individual teacher and his scorn of the superficial in education; for his preëminence in building men who are carrying forward his own high standard of straight, hard thinking in the teaching and practice of engineering.

HARDY CROSS, the seventeenth Lamme medalist of the Society for the Promotion of Engineering Education, was born in Nansemond County, Virginia, on February 10, 1885. As valedictorian of his class at seventeen years of age, he received the Bachelor of Arts degree from Hampden-Sydney College in 1902 and the Bachelor of Science degree there the following year. Later formal education led to the degree of Bachelor of Science in Civil Engineering from Massachusetts Institute of Technology in 1908 and to that of Master of Civil Engineering from Harvard in 1911, where he studied under Professor George Fillmore Swain, the first recipient of the Lamme Medal. Professor Cross is also the holder of three honorary degrees, Doctor of Science from Hampden-Sydney College in 1934, Doctor of Engineering from Lehigh University in 1937, and Master of Arts from Yale University in 1937.

Early teaching experience was gained as instructor of English in his final year at Hampden-Sydney and as instructor in English and Mathematics at Norfolk Academy during the next three years. From 1908 to 1910, he was an engineer in the Bridge Department of the Missouri-Pacific Railway. Following his year at Harvard, he became Assistant Professor of Civil Engineering at Brown University, where he taught structural, hydraulic, and sanitary engineering and planning until 1918. He then carried on a general practice in structural engineering for three years but returned to teaching in 1921 as Professor of Structural Engineering at the University of Illinois. He remained there until 1937 when he became Professor of Civil Engineering and Chairman of the Department of Civil Engineering at Yale University, the positions he now holds.

Professor Cross has served as a consultant on many engineering projects, particularly in connection with the settlement of the Charity Hospital in New Orleans and as member of a committee of engineers which prepared a report on the Tacoma Narrows Bridge disaster. He also has made great contributions to the civil engineering profession as a member of the National Committee on Suspension Bridges and of several committees of the American Society of Civil Engineers, the American Concrete Institute, and the American Railway Engineering Association.

The publications of Professor Cross demonstrate both his outstanding ability as an engineer and his compel-

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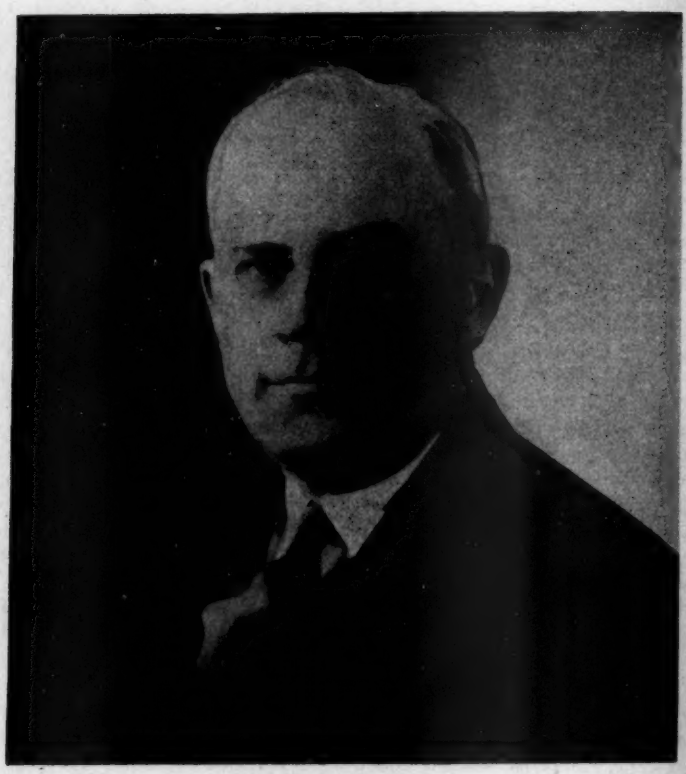

HARDY CROSS

RECIPIENT OF LAMME AWARD

ling interest in education. They include the book, "Continuous Frames of Reinforced Concrete" (with N. D. Morgan) and numerous technical papers, principally on structural engineering. Many of these have been of great significance, but one, "Analysis of Continuous Frames by Distributing Fixed-End Moments," presented before the American Society of Civil Engineers in 1930, excited an extraordinary amount of attention and comment. This paper, describing a method of structural analysis developed by Professor Cross through his teaching of design procedures, covered only ten pages in the Society's proceedings, but its discussion ran to one hundred and forty-six pages. The method is now used in design offices in all parts of the world and the concepts on which it is based have been influential in many other fields. For his professional achievements, Professor Cross has been awarded the Norman medal by the American Society of Civil Engineers and the Wason Medal by the American Concrete Institute.

Several of his papers are devoted to his deep convictions with regard to teaching. One in particular, "Concerning the Importance of Teaching School," delivered before a section of the Society for the Promotion of Engineering Education in 1936, puts into words the philosophy of his life as a man who regards teaching as a fine art, for which scholarship, productivity, and research are essential but in which great teachers are marked by the vision and inspiration given to the men they train.

The achievements and the testimony of the former students of Hardy Cross, many of them now outstanding in engineering education and engineering practice, bear witness to his success in reaching that high standard. To these men as undergraduate or graduate students, his professional eminence, the brilliance of his mental processes, his immediate perception of loose thinking, and his generosity with his time have been an extraordinary stimulus, have taught them to think under fire and to hold their own in competition, and have won from them great and lasting affection.

Professor Cross is a member of the American Society of Civil Engineers, the American Concrete Institute, the American Railway Engineering Association, the Institute of Consulting Engineers, the American Association for the Advancement of Science, and the Society for the Promotion of Engineering Education. He is an honorary member of the Connecticut Society of Civil Engineers and a national honorary member of Chi Epsilon. He is also a member of Sigma Xi, Tau Beta Phi, Sigma Tau, Amicron Delta Kappa, and Kappa Alpha (South.).

He married Edythe Hopwood Fenner in 1921. Their home is at 845 Whitney Avenue, New Haven, Connecticut.

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1928—George Fillmore Swain
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1941—Anson Marston
1942—Roy Andrew Seaton
1943—Thomas Ewing French

Harry S. Rogers, President, 1944-1945

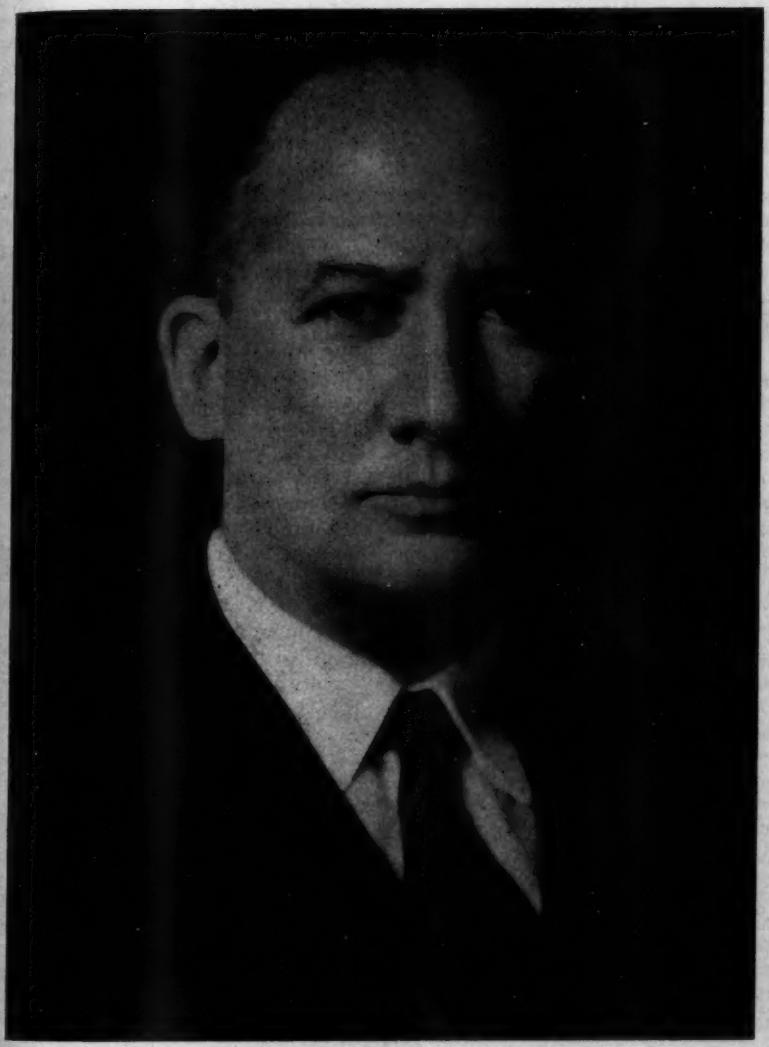
Harry S. Rogers, President of Polytechnic Institute of Brooklyn, is a native of Detroit, Michigan. As a youth he was inspired by activities in the field of construction and worked as an engineering aide in the testing laboratories of the Michigan Central Railroad before attending college. He took his undergraduate training at the University of Wyoming from which he graduated in 1914 and during vacations and absences from school he found many opportunities to work upon irrigation, railroad and municipal projects.

Immediately after graduation he joined the staff of Dean M. E. Cooley in the evaluation of the properties of the Pere Marquette Railroad. He then entered into engineering teaching at the University of Iowa and took up duties subsequently at the Universities of Wyoming and Washington and Lafayette College. During these years he had much opportunity to broaden his experience and increase his knowledge. For a while after 1918 he left the field of teaching and joined the engineering staff of the Truscon Steel Company of Youngstown, Ohio. There he received a broad experience in reinforced concrete and industrial building design and construction. In 1920 he returned to teaching at Oregon State College as Professor of Hydraulic Engineering and was subsequently appointed Head of Civil Engineering, Dean of Engineering and Director of the Engineering Experiment Station. He left Oregon to assume the presidency of Polytechnic Institute of Brooklyn in 1933.

While at Oregon, President Rogers carried on a consulting engineering practice in the field of water supply, sewerage and hydraulic power. He directed a sanitary survey of the Williamette Valley and was Chairman of the Executive Committee on Correction of Industrial Pollution of the Williamette River.

Throughout his career in education he has had wide interest in student affairs and activities. For years he has been an officer of his own fraternity and served a term as President of the National Interfraternity Conference. He served upon the athletic committee in most of the institutions with which he was associated and was Director of the Board of Athletic Control and faculty representative in the Pacific Coast Conference while at Oregon State College.

He has likewise always been interested in civic and public affairs and served terms as President of the Corvallis Chamber of Commerce, member of the State Reconstruction Advisory Board, and Vice-President of the Columbia River Association in the Northwest. He is now broadly identified with civic, educational and business interests in the Borough of Brooklyn. He is a member of the Board of Long Island College of Medicine, Brooklyn Hospital, The Board of Higher Education of New York City, New York Adult Education Council, Brooklyn



HARRY S. ROGERS, PRESIDENT, 1944–1945

Savings Bank, Intertype Corporation and the Advisory Board of the Brooklyn Branch of the Chemical Bank & Trust Company. He has served two terms on the Executive Committee of the New York Chamber of Commerce and is now President of the Brooklyn Chamber of Commerce. To meet the

need for a manufacturing company to produce certain elements of radar resulting from the research at Polytechnic Institute, he took the lead in organizing P.I.B. Products, Inc., and became its president.

He has taken an active part in fund raising for charitable and public purposes; was Roll Call Chairman of the Brooklyn Red Cross for two years, Chairman of the United Hospital Fund Campaign and first Chairman of the National War Fund Campaign.

In addition to the many educational duties imposed by the Engineering, Science and Management War Training program and the Army Specialized Training Program, President Rogers found time to serve his government in the Office of Production Management as Chairman of the General Products Division of Priorities and as first Chief of the Rubber, Cork and Synthetic Rubber Branch. In this capacity, he proposed the plan and set up the organization for the control of these materials. He left the services of the OPM in October 1941 but was called back to its successor, the War Production Board, in the spring of 1942 as Chief of the Rubber and Rubber Products Branch where he headed the control of natural rubber until October of 1943.

His clubs are Brooklyn Rotary (of which he is a past president) Municipal, Rembrandt, Brooklyn and Gipsy Trail, his fraternities are Alpha Tau Omega, Phi Kappa Phi, Tau Beta Pi, Sigma Tau and Sigma Xi; his societies are the American Society of Civil Engineers, The American Institute of Consulting Engineers, the American Association for the Advancement of Science, the Society for the Promotion of Engineering Education and the Newcomen Society. He has served terms on three of the major committees of the Engineers' Council for Professional Development and is now the Society's representative on the Council.

He received the C.E. degree from his Alma Mater in 1926 and was later awarded the honorary LL.D. Northeastern University also conferred upon him the honorary degree of Doctor of Science.

To the Members of the Society

August 15, 1944

Among the many problems that face engineering teachers and engineering schools in the coming academic year, what is the important thing which we would most desire for our organization? Is it progress toward the longer range objectives of education in the scientific-technological field or in the humanistic-social field? Is it orderly and constructive solution of the numerous problems surrounding the return of veterans and the reestablishment of our institutional operations? Is it the clarification of our relationships with the technical institutes and the coordination of our efforts into a united front serving industry and society at various levels and through various avenues? Is it the reorganization of our Society in a manner best to assist the engineering administrators in the solution of their current problems and yet to retain the unified nature of our organization? All of these are important; all are among the immediate objectives toward which we direct our abilities and our efforts. Yet to the S.P.E.E. there is one challenge and one objective which transcends them all. It is this, that all its members shall bring their talents and energies to bear upon these problems in a coordinated effort through the branches, sections, divisions and committees of this Society which has served engineering education so vigorously and constructively for over fifty years.

During this period we have constantly directed our attention toward the major problem of improving engineering education. We have, periodically, had reports upon the progress and status of engineering education and upon the means and procedures for its development and improvement. Each of these has served its purpose. None has failed to stimulate some needed and constructive developments. But no report can make any substantial contribution to engineering education unless it stimulates experimentation and development at the teaching level. No division or committee can be successful unless the membership of it takes from its meetings and deliberations new inspiration, new stimulus, new knowledge in the field of their interest.

The S.P.E.E., more than any other society in education, is operated by and is the expression of its membership. If we have a great year in 1944–45, it will be because you of the membership have the inspiration to serve and to contribute, take the time and give the energy to play a part in the studies, the work and the deliberations of our various committees and units. Our program is clearly mapped before us. The Report on Engineering Education After the War presents a challenge to organize a division in the humanistic-social fields. The action of the administrative division at Cincinnati presents a challenge to work out a pattern of operation which will enable the Society to support the deans and administrators in the solution of many difficult problems of relations with governmental agencies and other forms of education. The operation of the GI Bill and a variety of other bills before Congress present a challenge for a united and coordinated action. The growth of subdivisions in the Society within the last ten years has progressed to the point where it may be wise to stimulate more joint meetings of committees and divisions.

All of these undertakings will require not only the interest and efforts of committee members but the counsel, advice and aid of the Society membership. Inform yourselves upon the operating organization to accomplish these tasks and participate in the work by constructive suggestions even though you may not be on any committee membership.

H. S. Rogers,
President.

The Engineering Profession Tomorrow

PRESIDENTIAL ADDRESS PRESENTED AT THE FIFTY-SECOND ANNUAL MEETING OF S.P.E.E., CINCINNATI, JUNE 22–25, 1944

By ROBERT E. DOHERTY, *President*

The engineering profession tomorrow will be largely what engineering education today makes it. The policies of industry, government, and State Boards of course will have their influence. Nevertheless, the character of the profession—the height of its purpose, the extent to which its members live up to its ideals, the nature of its standards—must rest fundamentally upon individual convictions, individual attitudes, individual intellectual power; and these qualities are largely molded in college. The form of the mold is determined by the teachers and administrative officers of engineering colleges. If the profession is to be brought to the level which America needs, and is to receive the recognition which it deserves, the educators must bring it there. This is a pointed responsibility that, in light of lessons of the war, weighs upon us as it has not weighed upon any previous generation; it is a challenge we must accept.

Among these lessons, at least two point directly at us. One is that engineers, along with members of other professions and American citizens generally, were altogether unprepared either by interest or understanding to cope with the fundamental issues that, during the last two decades, underlay the emerging global conflict. Indeed, right up to Pearl Harbor, we as a people were incredibly unaware of our actual plight. Once war was upon us, engineers arose magnificently to the technical job it imposed. However, they are contributing little to the clarification of muddled thinking about the foundations of peace. As citizens who have been privileged by society to receive higher education, they should be in position also to take a leading hand with others so privileged, in understanding and clarifying and determining action upon those political and social issues on which the future peace, freedom, and prosperity of the country depend. The second lesson of the war is that the engineering profession found itself near complete paralysis when there was need for unified action on matters of common concern in connection with the war effort. As a member of the Engineers' Council for Professional Development for six years, during the last three of which I was Chairman, I had first-hand experience in this matter. The problem was of course not new. The practical inability of the several branches of the profession to act in a common cause is traditional; merely, the fact that they could not effectively unite for common action in war indicates the depth of the malady. Their tradition of isolation is understandable in light of the history of the successive beginnings

and independent growth of the several branches of the profession. But the world moves on; change is inevitable, even in the engineering profession. While I make no predictions as to the specific nature of the evolution of the profession, especially of its organization, I do venture to predict that there will be—must be—change in point of view. The engineering profession must rise to a new level. That is our lesson from the war.

Engineering education is the primary source from which this rise must spring, and the Society has taken steps to vitalize that source. One of the first official acts of your President last fall was the appointment of a Committee on Engineering Education After the War under the chairmanship of Dean Hammond. The spirit, purpose, and unanimity of view of this large, representative Committee have been most gratifying, and a General Session of this Convention will be devoted to its report. I hope I may solicit your interest in this report and in doing something about it at once in your respective institutions. I regard as very great the importance of establishing a clearer picture of the profession and of the professional man we are attempting to educate, and accordingly of the general requirements of his education. I know there can be little enthusiasm for the fundamental revision of engineering curricula recommended in the Committee's report unless there is a new vision comparable to that of the Committee of what a member of the engineering profession should be. I therefore venture to outline such a picture.

In the first place, I must raise the old question, What is the engineering profession?

Thought on this question is extremely confused. To mention one evidence, the E.C.P.D. Committee on Professional Recognition, after some ten years of futile effort to establish criteria of recognition, gave up this direct line of attack and turned to the engineering colleges in the hope of developing in the new generation a reasonably clear professional purpose—a professional consciousness and like-mindedness—that the present generation of engineers does not have. Engineers are objective and clearheaded on their *work*, but when it comes to defining their field, their professional relationships, their specific educational programs, these distinguished qualities seem to vanish!

The two primary reasons for the confusion need hardly be reiterated. The first is that engineering graduates have entered many fields beyond those directly related to their engineering studies—for example, general management in business and industry, commercial work, accounting, and so on ad lib. We are all familiar with the ill-advised view that since engineering training has made success possible in these fields, they should be regarded *as* engineering when pursued by engineers. This loose thinking confuses what an engineering graduate *may do* with what engineering *is*.

The other primary reason for confusion is the no-man's land between professional and sub-professional activity. There is no line of demarcation. And the confusion, already bad enough, has been greatly increased during the war. A high-school graduate learns in an ESMWT course how to carry out a specific routine of test or calculation, and ipso facto becomes an engineer!

Let us try to clarify some of this confusion. Are there any firm grounds

on which we can stand in indicating what, fundamentally, distinguishes the engineering profession from others and from the body of nonprofessional technicians? I think there are, but before I undertake a suggestion, let me confess to one of our handicaps. A struggle which I have myself experienced and discerned in others is trying to think through this problem without being bedeviled by such questions as how one's ideas if adopted would affect membership in engineering societies, or engineering enrollment, or the importance of one's particular course. I believe, however, that we can be realistic about such practical matters and yet proceed with a clear purpose; I am certain that we should do so.

In beginning such procedure, we must draw some general boundary lines. I certainly would not lay undue emphasis upon a legalistic approach, but there are a few simple criteria for a professional group that are, I believe, essential for our purpose and also rather widely acceptable. They are as follows:

1. that its members shall have acquired an organized body of higher learning
2. that they serve their clientele by the application of that learning
3. that they control a system of professional education and strive continually for its improvement
4. that they share a common purpose and method of service and a common code of conduct with respect to each other and to their clientele.

Then I would add a fifth:

5. that they serve their country by expert counsel in their field, by participating as civic leaders in community enterprises, and by forming intelligent judgments on political issues and then actively supporting them.

I believe these points are not inconsistent with the thoughtful pronouncements by President Wickenden * and Dr. Bush,† who are engineers, by Abraham Flexner,‡ a student of higher education, and more recently by Dr. Robert S. Lynd,§ professor of Sociology at Columbia University—with all of which pronouncements I assume you are familiar.

To these five criteria for professions in general, we must add one that will identify the profession of engineering. I realize that at this point we enter highly controversial grounds. After studying numerous definitions in which attempts have been made, for one purpose or another, to bound the field of engineering, I would suggest the following modification as both essential and sufficient *for our purpose:*

> Engineering is the art, based primarily upon training in mathematics and the physical sciences, of utilizing economically the forces and materials of nature for the benefit of man.

This definition will be criticized as too narrow; it should include organizing and managing men, social responsibilities, etc. But remember: other people and other professions as well as engineers have responsibilities in these areas. We are not trying to state everything a member of the engineer-

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* "The Second Mile," *Electrical Engineering*, pp. 242–247, May, 1942.

† "The Engineer and His Relations to Government," *Electrical Engineering*, pp. 928–936, August, 1937.

‡ *Universities*, Oxford Press, pp. 29–31, 1930.

§ *The New York Times*, March 18, 1944.

ing profession may conceivably do; we are trying rather to suggest broadly those things that distinguish him from other professional men. For our purpose we need do no more, but if we are to get anywhere with our present task we must do at least that.

If we accept these six criteria for the engineering profession, we are in position to be more specific as to its differentiation from other professional and quasi-professional groups whose work touches or overlaps engineering.

Consider a few examples. Take the engineer, a member of the profession, who manages a business or a large industrial enterprise at top level where the functions are *general* management, or who runs a bank or accounting firm. Is he practicing engineering? Is the lawyer who does the same things practicing law? I think we need not labor that question further. The engineer is still an engineer, the lawyer is still a lawyer but neither is practicing his profession.

What, then, is he practicing? It may or may not be a profession. It is if it meets the criteria—a body of higher learning, a common purpose and method, a common code. For example there is unquestionably an emerging profession of business and industrial administration, but it has not yet arrived. Indeed, its development seems far behind that of engineering. Meantime those professional people like lawyers and engineers whose fields and methods are related to some of the basic requirements of professional management have found satisfaction and success in these management fields. A professional engineer in such management is practicing a quasi-profession, but it is not engineering. Let me repeat: we must not confuse what an engineer happens to do with what engineering is. This point has fundamental significance when we are considering engineering education. We should not, I venture to suggest, sacrifice essentials in engineering education for courses in general management and thus have neither fish nor fowl.

The engineer's particular qualification for management is his method—the engineering method. But the engineer has no monopoly on that method—the method of a carefully calculated plan based upon principle and fact. It comes near to being mere professional common sense. Certainly one finds scientists, physicians, and businessmen who use it. However, it deserves the name, because the engineer has demonstrated its power; he has *always* used it; he has become its symbol. And therefore wherever, as in management, such a straightforward, rational approach is effective, those engineers who in their stride can learn the necessary new subject matters outside engineering become successful.

However, there is a kind of management that *is* engineering. It is, obviously enough, the management of engineering operations, involving the engineering executive whose decisions rest upon the professional qualifications we have defined—decisions, in other words, that a lawyer or businessman is not competent to make. Included in such management is the supervision of industrial production. Passing judgment upon the specification, design, and cost of machine tools together with other aspects of a production plan, and controlling the flow of materials and products, certainly fall within the scope of engineering as we have defined it, just as does the making of such a plan. Engineering education should therefore recognize such management *as* engineering.

Turning from such distinctions at the professional level to the boundary between professional and sub-professional levels, we may, I think, draw this important line of demarcation by two ideas, One has already been mentioned: that the members of the profession must have acquired "an organized body of higher learning." This, I take it, means educational progress at least up to the level of the baccalaureate degree. The second idea is that the engineer's work is characterized largely by rational processes, whereas sub-professional work is characterized largely by rule-of-thumb methods. These distinctions are educationally most important.

All of these boundary lines and distinctions are intended to afford a basis for outlining an adequate picture of a member of our profession, and thus for outlining what his education should be.

In that picture I see an educated man who can take his place in the community among members of other learned professions; who has *mastered* the essential "body of higher learning" that underlies his profession including a live knowledge, sufficient for good citizenship, of the world in which he lives; who has learned to think critically and constructively in terms of that knowledge; who has mastered the engineering method; who has cultivated to the utmost his creative talents; who has a professional consciousness and lives by it; who has traveled The Second Mile; and who plays the part of a leader in civic affairs. That is the kind of man we should visualize when we are planning engineering education after the war.

Needless to say, one would scarcely expect to see all engineering graduates achieve such full stature any more than the medical profession can expect to see all of its members achieve top stature, but I am nevertheless proposing that engineering education should set as its main task the planning of programs whose purpose would be to cultivate such professional men and therefore such a profession. Those who would achieve something less than such a full stature would yet be professional men whose education had at least laid the right kind of foundation.

If we accept the picture here outlined, we are in position to indicate the primary requirements with respect to which any program in engineering education should be tested. In the first place, has the "body of higher learning" been clearly defined and does the program lead toward its mastery? Secondly, is the "engineering method" in its broad sense clearly formulated and its cultivation carefully planned for in all phases of the program? And finally, are there definite provisions for developing a "professional consciousness"? My purpose is certainly not to answer these questions, for I believe they are appropriately answered in broad outline in the Report of Dean Hammond's Committee. I wish merely to indicate a few personal opinions regarding them.

The stumbling block is the "body of higher learning." I wish that some wise providence might cleanse our souls when we sit as designers of educational programs. Why, if our purpose is the cultivation of an intellect, do we feel under such irresistible compulsion to clutter the student's mind with an impossible tonnage of inert, undigested subject matters? We tend to include everything to the limit only of the student's time and endurance, and certainly at the cost of unfortunate sacrifices in thorough understanding

and in the art of constructive use of the knowledge he does acquire. I wish to submit a practical suggestion as to how subject matters may be intelligently limited.

It is to define specifically the *essential* body of technological learning underlying the branch of engineering concerned. As tests for defining it, I would suggest three criteria:

1. it should include the fundamental ideas, principles, and basic facts underlying the field and be limited largely to these and to materials involving their direct application
2. it should be limited to what can be thoroughly understood
3. it should be limited largely to what will be *used* later by the student in a *planned* curriculum, or in post-graduate or post-college study.

A similar procedure is of course also called for on the humanistic-social side.

Then I wish to submit a thought or two regarding the cultivation of method. This is educationally the crux. Intellectual power, not merely routine skills and memorized facts, is the primary end. Acquisition of subject matter without a cultivated intellectual method of applying it to practical situations is educational sterility. Such method and power are characterized by efficient intellectual approach, by the ability to relate ideas to situations. A few components are:

a. resourcefulness in identifying relevant data, in distinguishing the important from the trivial
b. ability to analyze a practical situation in terms of principle and to draw rational inference
c. resourcefulness in inventing means to an end
d. capacity to distinguish between a verified generalization and a doctrine or policy, between fact and opinion
e. habit of thorough understanding
f. capacity for making value judgments
g. ability to organize thought, to relate ideas logically, and to express them well in writing or speech.

These qualities do not appear spontaneously; they must be cultivated. The colossal and tragic blunder in education today takes rise from the fallacious assumption that a mind crammed full of subject matter will automatically become a cultivated intellect. One sees at the low end of the scale in educational procedure an instructor pouring out words to passive students; at the high end, the students taking the active part under the guidance of an instructor who realizes that the student's business is to learn to understand and think and do according to a carefully constructed educational plan thoroughly understood by the instructor. Any curriculum or individual component of it that is planned without primary emphasis on the cultivation of powers and qualities mentioned above represents a vital sacrifice imposed upon the student in the interest—of what? I can think of only one thing: the outmoded educational tradition of yesterday.

Let me urge with all the force I can a shift in emphasis in educational planning from subject matter to intellectual method, from cramming to constructive thought, from the talking instructor to the active student. Let us plan to cultivate precious intellectual qualities and

thus give the students what they have the right to receive.

My purpose here has been to focus the attention upon our inescapable responsibility—the cultivation of a renaissance in the engineering profession. I have tried to show that the profession must rise to a new level, must become more closely knit, and that engineering education must bring it to this new estate. But this undertaking is hopeless unless we are much clearer on what should constitute the engineering profession, unless we have a correspondingly clearer picture of what the individual member of the profession should be and therefore of the kind of education that will produce him. We can not develop such a profession and still continue to regard engineering as everything an engineer may do and to gloss over civic responsibilities. Hence I have suggested boundary lines for the profession, tried to establish a picture of the ideal professional engineer, and to outline his educational requirements.

The Report of the Committee on Engineering Education After the War points the way in education, and the coöperation of the E.C.P.D. and S.P.E.E. committees according to a definite plan approved by both bodies affords the means for developing professional interest and understanding. Moreover, the E.C.P.D. Committee on Canons of Ethics is, after years of patient study, struggling toward a formulation acceptable to the whole profession. So the profession is trying to be reborn. I hope that we, as engineering educators, shall accept the opportunity now before us to take the lead in professional education, and lay the foundation for a genuine engineering profession that must, sooner or later, inevitably come, and that would contribute significantly to a prosperous and secure America.

Address*

A Greeting and Thoughts Regarding the Engineering Profession

By RAYMOND WALTERS

President of the University of Cincinnati

I

A most cordial welcome to you members of the Society for the Promotion of Engineering Education who have assembled here for this fifty-second annual meeting! It is my honor and very great pleasure to extend you the characteristically warm hospitality of the City of Cincinnati and the University of Cincinnati. Both have a direct and lively interest in the profession of engineering and in the teaching of engineering.

Cincinnati, which is called a Northern city with a Southern exposure, has built its renowned cultural life upon its flourishing industry and trade that have their fundamental basis in technology.

The University of Cincinnati, which has been termed "a municipal university and a national institution," treasures among its ten colleges and schools of the arts, sciences and professions, the college where the coöperative method of technological education originated nearly forty years ago and from which it has spread widely.

It so happens that the University is celebrating this year the one hundred and twenty-fifth anniversary of higher education in Cincinnati, and comment upon this historical background may prove appropriate and of interest to you. The University of Cincinnati has two founding dates: 1819 and 1870. The latter date of 1870 marked the creation of the University under the first municipal university code; and its present organization will thus be seventy-five years old next year. The significant thing is that proponents of the Act of 1870—Superintendent of Schools John Hancock, Judge Alphonso Taft and other leading citizens—expressly aimed to consolidate existing colleges into what Dr. Daniel Drake, great scientist, physician and teacher of Cincinnati, had foretold, "a flourishing city university."

The year 1819 saw the chartering of two present colleges of the University of Cincinnati: Cincinnati College, now represented by the College of Law, and the Medical College of Ohio now represented by the Medical College of the University. The University thus holds, through two component units, a record of a century and a quarter of service to the city and the nation.

When Cincinnati College first opened its class-room doors on May 3, 1819, it was a community triumph. For, as early as 1807 when the population was only 1,500, a group of Cincinnati pioneers had obtained a charter for "Cincinnati University" and actually started construction of a brick edifice. By 1819 Cincinnati had a population of

*Presented at the 52nd annual meeting, S.P.E.E., Cincinnati, Ohio, June 22–25, 1944.

more than 10,000 (New York City then had only about 130,000 people), and Oliver Farnsworth proudly described Cincinnati as an "active and commercial city" possessing "that politeness and urbanity of manners which distinguishes the polished circles of older cities."

The heyday of Cincinnati College began in 1834 when Dr. Drake and others revived instruction after a hiatus occasioned by the nation-wide financial depression of the early 1820's which hit Cincinnati with special fury.

In the ten years from 1835 to 1845, Cincinnati increased in population from 29,000 to 50,000. It became known as Porkopolis for the magnitude of its butchering and Queen of the West, as the poet Longfellow crowned it, for its culture, social charm and education.

In the decade 1835 to 1845, Cincinnati wrote a significant page in the history of higher education in the United States.

Cincinnati College, under President McGuffey of the famous *McGuffey Readers,* contributed a notable list of "firsts" regionally or nationally:

The first professorship of music—

The first large astromical observatory, through its Professor Mitchel—

One of the first scientific curricula of the era—

The first Western educational association, or teachers' institute—

The first law school now existent west of the Alleghenies—

A medical department in which Dr. Drake led a faculty as brilliant as any in America—

And, of especial interest to you of the S.P.E.E., Cincinnati College in the late 1830's had one of the first courses in civil engineering in the entire country. It was established by Ormsby M. Mitchel, Professor of Mathematics, Mechanical Philosophy and Civil Engineering. Professor Mitchel was a graduate of West Point and later served as a Union Army general in the Civil War. The course in civil engineering was given as "an option in the senior year."

This engineering innovation of an earlier century was not without its emboldening effect upon a pioneer of our own generation, Dean Herman Schneider. I recall his conversational reference to it in the spring of 1932, when we were discusing my succeeding him as President of the University so that he could devote himself to the College of Engineering and Commerce and the extension of the coöperative system to include a graduate course—a crowning work which he lived to see fulfilled.

Two years ago, at the dedication of Northwestern Technological Institute of Northwestern University, I paid tribute to Dean Schneider—the man and his work—in a paper printed in the dedication proceedings and also in *The Bent* of Tau Beta Pi.

Today I shall restrict my eulogy to saying that here was a man of such originality as to fulfill what Oliver Cromwell declared of the Quaker, George Fox: that "he was no man's copy," that here was a man who had such zest in the finer things of life, such understanding of young men and their problems that, apart from his professional contributions, Herman Schneider will always live in the hearts of those who knew him.

It is with keen satisfaction that I record two recent testimonials: the publication of Professor C. W. Park's excellent biography, "Herman Schneider: Ambassador to Industry"; and the donation by Cincinnati industries of a fine clubhouse, at 1349 East McMillan Street, for local engineering so-

cities under the Herman Schneider Foundation.

When you come to the campus this afternoon for the general session in Wilson Auditorum, you will not find the normal conditions of a University which, in peace years, has well over 4,000 full-time students and a grand-total enrollment of more than 10,000. You will see rather a war-time University which was recently the training school for 2,450 soldier-students and which instructed also some 2,000 young women and civilian men students in liberal and professional courses. The Summer session is now in progress, with graduate students and undergraduate accelerants totalling about 600.

I join Professor Anderegg and his committee on arrangements in inviting you to stroll about the campus following this afternoon's session in Wilson Auditorium to see particularly the University Library, the Student Union and the Herman Schneider Quadrangle of the College of Engineering and Commerce and School of Applied Arts.

II

With the encouragement kindly given me by President Doherty, I am extending my welcoming address to present a brief statement of a conviction that has long been in my mind and heart. It relates to the enlarged share which I believe engineers should take as leaders in broad aspects of American life; in the economic and civic affairs of city, state and nation.

Let me assure you, first of all, of my pride in the past and present contributions of technology, a pride which I feel as one associated with engineering education as teacher and administrator for many years.

During the four decades from 1900 to 1940, American technology made splendid achievements in design and construction. Typical of these are the skyscrapers of our large cities and bridges such as those which span the Delaware River at Philadelphia, the Hudson River at New York and the Golden Gate at San Francisco. (It is a great satisfaction to us here that the Golden Gate bridge was designed and built under the direction of a University of Cincinnati graduate, Joseph Strauss.) These structural and architectural masterpieces possess a functional beauty ranking with those of Greece and of the Middle Ages. Along with utility, American technology has brought fresh and thrilling loveliness into the world.

In this World War II the nations of representative democracy, starting far behind in military preparedness, are now surpassing the German and Japanese best. Our men of science, technology and industry who enjoy freedom of the human spirit are outdoing the servile experts of the Nazi and Japanese dictatorships. Giving the utmost credit to our Allies it may fairly be said that the contributions of America have been enormous as to quantity and superb as to quality. And in this achievement, the profession of engineering has had a multifarious part and holds a distinguished place.

It is precisely because of this distinction in the peaceful past and in the present war, that engineering should, in the era to come, fulfill St. Paul's exhortation to "covet earnestly the best things."

This leads me to my thesis that American engineers should increasingly concern themselves with the economic, the social and the civic prob-

lems which will face us in the next decade, indeed for the next half century. These will include international problems such as organizing a wise and practicable world association to preserve peace among the nations and commissions to adjust international currency and trade; domestic problems such as the conversion of war industries; immediate reëmployment of returning veterans, and subsequent employment of workers in unprecedently high numbers; union labor relationships; Federal debt policies; taxation; and a host of other problems which will demand an intelligent public opinion as well as the skill of experts.

In certain of these fields, engineers are already competent to think and to act by virtue of the discipline of their training and experience. For the longer run, engineering students should, I think, be increasingly instructed in economics and other social sciences to prepare them for service in the decades to come. This is where you teachers and administrators can take your guiding part in a genuinely important way.

A heartening illustration of the intelligent and practical concern I advocate is supplied in the attack which industrial leaders, including some trained in technology, are making upon one of the greatest of all economic problems, the problem of avoiding mass unemployment (mass as contrasted with local or seasonal unemployment which may not be avoidable but can nevertheless be insured against). The National Committee on Economic Development has been and is actively at work to provide employment on unprecedented levels. If successful it will answer by deed rather than by word the prophecies which certain writers are uttering as to the doom of capitalism, or free enterprise, and its replacement—which they assume to be inevitable—by communism or some form of collectivism.

In regard to the system of private enterprise, I venture opinions which possess no professional authority, which are subjective and personal, and which have the merit only of being long-considered and honest.

I favor private enterprise because it seems to me to afford the best soil for the growth of the American ideals set forth in the Constitution and the Bill of Rights: a more perfect Union, justice, domestic tranquility, the common defense, the general welfare and the blessings of liberty. Believing in the educational tenet of freedom of the human mind and in the religious doctrine of the dignity and worth of the individual soul, I conclude that private enterprise permits better scope and cleaner air for such values than does communism or any form of dictatorship—whether of Fuehrer or Commitern. I admit and lament injustices and inadequacies in private enterprise and favor wise measures to regulate and to act broadly for the common good. I accept the view recently stated by the distinguished economist of the Proctor and Gamble Company, Dr. Nathaniel R. Whitney, that we need a "new, cooperative point of view on the part of private individuals and government agencies in order to make private enterprise work."

You may have seen Harold Laski's new book in which he calmly assumes that private enterprise must go, that collectivism is inevitable. As a nonprofessional, a mere layman long since inoculated by John Stuart Mill's "healthy skepticism," I would remind Mr. Laski, *et al*, that a full century has

passed since the ancestoral voice of Karl Marx similarly prophesied woe.

I suggest that we who are engaged in technical education should increasingly direct the thinking of our students to the vital matters of production, distribution and employment. We might point out that a hundred and fifty years ago Malthus maintained that, inasmuch as population grew at a geometrical ratio and the means of life increased at an arithmetical ratio, therefore the condition of the poor was doomed to become more and more hopeless.

Our students will perceive the damage which science and technology have done to Malthusian logic. They know that the modern production of food and of material can be of a magnitude sufficient to feed, clothe and house not only the American people but the human race.

We teachers must say frankly to our students that while we—that is, our present economic society—know how to produce, we do not know how to to distribute adequately, and therein lies the problem of mass unemployment. It would seem that the latter problem can be solved just as the former was. Here is no situation created by what the legal contracts term "an act of God." Mass unemployment is a man-made problem, and should be solved by man,—that is, by men of intelligence and good will.

We teachers may well suggest to our students a happy contrast. After the close of World War I, industrial management's formula was simply "Retrench." Today our industrial leaders of intelligence and good will are uniting to put into practice the economic principles set forth in such studies as "America's Capacity to Produce" and "America's Capacity to Consume" made by the Brookings Institution. They will do their utmost to provide employment for returning war veterans and for all the working population.

There will probably be an intervening period, after war contracts stop and before peace-time readjustments are made, when public construction jobs will prove necessary, jobs to be financed by public taxation. But the long-run objective and endeavor will be an economy of *private* enterprise for the *public* good.

While I have not discussed it with him, my guess is that you will hear something of this same doctrine in the address at the S.P.E.E. dinner Saturday evening to be given by my good friend, Fred V. Geier, President of the Cincinnati Milling Machine Company. Mr. Geier typifies the industrial leader who concerns himself with economic problems. Two other notables who exemplify this are H. W. Prentis, Jr., President of the Armstrong Cork Company, who has long studied national issues and has written with penetration and force regarding them, and Eric A. Johnston, President of the U. S. Chamber of Commerce, whose addresses are noteworthy for insight as well as eloquence.

Among engineers and engineering educators who illustrate the kind of broad activity I mean are Gano Dunn, President of the J. G. White Engineering Corporation; Dr. Karl Compton, President of the Massachusets Institute of Technology; Vannevar Bush, President of the Carnegie Institution; and Dr. W. E. Wickenden, President of the Case School of Applied Science.

What I am advocating is supported in a paper (which I did not see until my address to you was practically completed), read before a conference of

chemists and chemical engineers by Dr. Walter S. Landis, Vice-President of the American Cyanimid Company:

"You have been grounded in science. You know the analytical process of observing the facts, weighing the data, and reconciling the observations. This rigorous discipline of mind must not and cannot repose within the four walls of a laboratory or be enmeshed only in the production line. It is up to you to analyze and understand these great political and social movements and . . . to spread the gospel of sound economics and sound government."

And, concludes Dr. Landis, it is the job of the engineer and technologist to associate with political parties and political movements in order to bring intelligent and sound thinking to practical effectiveness.

Without anticipating what Dean Hammond, President Rogers and President Wickenden may say at their symposium tomorrow morning, I hazard the hope that their proposals for Engineering Education After the War will include reference to instruction in economic and civic subjects, including American history. The foundation for thinking in these fields should be laid in collegiate years if students are to develop into engineers who, in addition to being technical experts, will likewise be effective leaders in national life.

As a profession, engineering has been defined in broadening terms from Thomas Tredgold to the present. But, beyond his professional duties, the American engineer of tomorrow will, I trust, grasp the ancient Athenian conception of active service as a citizen. In American life this may embrace not only public or political activity but civic activity such as participating in community affairs: War Bond and Red Cross campaigns, trusteeship in the management of art museums, orchestras, public libraries, boards of education and colleges. The individual engineer who, in his local community, manifests alert, intelligent and fearless citizenship, helps to raise the prestige and honor of the engineering profession.

One concluding suggestion to teachers. Some months ago I heard an address regarding technology and liberal arts delivered by the dean of a land-grant college. This dean praised the value of liberal knowledge and then made a plea for technology, for engineering instruction, as essential to America in the approaching era. I agreed heartily but I regretted that the speaker seemed on the defensive, apologetic.

My contention, as a liberal arts graduate myself who taught English to engineering students for over twenty years, is that engineering, if rightly taught and rightly studied, can actually be made liberal as well as professional.

William James once said that you can give humanistic value to geology, economics, mechanics, by teaching them historically "with reference to the successive achievements of the geniuses to whom these sciences owe their being."

Most of us know some teachers who in themselves and in their teaching exemplify this dictum of James. It is a goal to which every teacher, every student of engineering might modestly but earnestly aspire: to attain, in addition to professional efficiency, the humanistic qualities of imagination, flexibility and devotion to the common good which mark the man we call liberally educated.

Minutes of Council Meetings, June 22-25, 1944

Present: Robert E. Doherty, A. R. Cullimore, H. J. Gilkey, J. S. Thompson, F. L. Bishop, J. H. Belknap, A. C. Callen, F. M. Dawson, N. W. Dougherty, S. Fairman, C. J. Freund, H. L. Dodge, L. J. Fletcher, R. L. Spencer, C. E. Tucker, Jos. Weil, E. L. Eriksen, T. Saville, R. H. Spahr, G. L. Sullivan, F. L. Wilkinson, W. R. Woolrich, D. C. Jackson, C. F. Scott, R. L. Sackett, A. A. Potter, R. A. Seaton, W. E. Wickenden, H. P. Hammond, S. B. Earle, O. J. Ferguson, D. B. Prentice, A. H. White, H. T. Heald, 34.

The following actions were taken by the Council:

1. Report of the auditor, presented by the Treasurer, J. S. Thompson, was accepted and ordered printed.

2. Report of the Secretary, F. L. Bishop, accepted and ordered printed.

3. Upon the recommendation of the Executive Committee, Council approved the investment of $2,500 in Government bonds, Series G.

4. The invitation of Washington University, St. Louis, Mo., was accepted and the 53rd annual meeting will be held there June 21–24, 1945.

5. H. S. Rogers elected a representative of the Society on the Engineers' Council for Professional Development.

6. D. B. Prentice elected a representative of the Society on the American Council on Education.

7. F. L. Bishop was appointed Secretary for 1944–45.

8. J. S. Thompson was appointed Treasurer for 1944–45.

9. Reprinting the report on technical institutes published in 1931 was referred to the Executive Committee with power.

10. New committees to be appointed by incoming President:

a. To review the Constitution and By-Laws of the Society for the purpose of adapting the organization of the Society to the needs of the present time and submit such recommendations as the Committee sees fit to the Council (preferably at the October 1944 meeting in Chicago).

b. A committee on professional development.

c. A committee to study the five-year curricula.

11. The Executive Committee was requested to give attention, during the year, to the question of financial assistance to sectional activities of the Society, study the income and expense of the Society, and approve a plan so that problems brought forth by the New England Section may be met.

12. S.P.E.E. approves the plan of accrediting technical institutes as proposed by the Committee on Engineering Schools of E.C.P.D.

13. The report of the Committee on Engineering Education After the War is to be presented to E.C.P.D. for endorsement.

14. Approved the request of the Engineering Drawing Division for a summer school in 1945. The Division is asked to prepare and submit a budget for out-of-pocket expenses not to exceed $200 which Council appropriated for this school.

15. Appropriations were granted to the following:

Committee on Engineering Schools, E.C.P.D., $500.
Mechanics Division for continuation of survey, $100.
Engineering Drawing Division for summer school, $200.
Measurement and Guidance Project, $300.

16. The following new divisions were authorized:

Educational Methods.
Humanistic-Social Studies.
Physics.

17. Life membership was granted to A. L. Cook and O. M. Leland.

18. The following statement of policy was sent to Commissioner Studebaker of the U. S. Office of Education by A. A. Potter, Chairman of the Division of Administrative Officers of Engineering Colleges for 1944-45:

Statement of Policy as to Senate Bill 1946, 78th Congress, Second Session, adopted by the Council of the Society for the Promotion of Engineering Education, June 25, 1944: In the administration of this proposed legislation, if adopted, as applying to vocational-technical training the state boards or commissions to be designated by the governors or other competent authority shall include representatives of the state boards of vocational education, the engineering colleges, the technical institutes, the junior colleges, and the other institutions participating in this form of education and training.

19. The following budget for 1944-45 was adopted:

Estimated Receipts:		
Current dues—individual	$14,000.00	
institutional	2,325.00	$16,325.00
Back dues		1,000.00
Sale of publications		500.00
Advertising		3,000.00
Refund Lamme medal		191.00
From surplus to balance budget		684.00
		$21,700.00
Estimated Disbursements:		
Meeting	$ 1,000.00	
Journal and Proceedings	9,000.00	
Committees and conferences	500.00	
Secretary's honorarium	2,000.00	
Clerical assistance	4,300.00	
Postage and supplies	1,200.00	
Travel of Officers	300.00	
Travel of Secretary's office	400.00	
Administrative Division	1,000.00	
Emergency fund	1,000.00	
Dues: American Council on Education	100.00	
Contribution E.C.P.D. Com. Eng. Schools	500.00	
Mechanics Division	100.00	
Measurement and Guidance Project	300.00	
		$21,700.00

NOTE: After the above budget was adopted, Council appropriated $200.00 to the Division of Engineering Drawing for a summer school in 1945.

20. The following recommendations were adopted:

The Committee on Secondary Schools of the S.P.E.E. believes that

improvement in the teaching of science and mathematics in secondary schools is one of the most effective means of:

1. Achieving closer relations between the engineering colleges and the secondary schools.
2. Improving the quality of preparation of students entering the engineering colleges or other post-high-school programs of technical education or training;
3. Improving the preparation of secondary school graduates for industrial employment.

We, therefore, suggest that the Society for the Promotion of Engineering Education take such positive steps as may be feasible to:

1. Encourage an expansion of the offerings by secondary schools in mathematics, physics and chemistry;
2. Encourage programs for the training of teachers in these subjects;
3. Support means and ways by which secondary schools may more successfully compete with industrial employment in attracting and holding competent teachers of science and mathematics.

This Committee also recommended:

1. That the Society encourage membership in the Society for the Promotion of Engineering Education of secondary teachers and officials interested in engineering education.

2. That engineering colleges make every effort to give high school authorities and students pertinent information concerning their respective institutions and the profession of engineering.

3. That the Committee on Sections and Branches be asked to encourage joint meetings with high school superintendents, principals, advisors, and teachers.

4. That every engineering college be urged to report to the high schools the progress of their graduates in the college of engineering.

5. That if the Society is to continue to have a Committee on Secondary Schools that such committee should contain representatives of secondary schools.

21. Humanistic-Social Studies: W. E. Wickenden made a report concerning the conference to be held this fall at Princeton University.

22. The following resolution recommended by the Division of Administrative Officers of Engineering Colleges was adopted:

The Executive Committee of the Society may, at its discretion, act in the name of the Society in coöperation with the Executive Committee of the Division of Administrative Officers of Engineering Colleges in matters, initiated by the latter, of administrative relationships between the engineering schools and colleges and other professional organizations or societies and in matters of public policy and public relations pertaining to the effective functioning and the mutual welfare of the engineering schools and colleges as separate or integral units of higher education.

23. Measurement and Guidance Project: Council voted to express its appreciation to the Carnegie Foundation for the Advancement of Teaching and the Carnegie Corporation of New York for its generous support and the effective advancement of engineering education by its program on Tests and Measurements in coöperation with S.P.E.E. and E.C.P.D.

24. U. S. Office of Education Committee on Vocational-Technical Training: R. H. Spahr, a member of this Committee, made a report.

25. 63 individual and 1 associate institutional member were elected.

Minutes of the 52nd Annual Meeting, June 22-25, 1944

The 52nd annual meeting of the Society for the Promotion of Engineering Education was held in Cincinnati, Ohio, June 22–25, 1944, the University of Cincinnati being our host. Robert E. Doherty, President, presided. The meetings were held in the Netherland Plaza Hotel and the University of Cincinnati, and were attended by over 900 members and guests. 31 conferences were held.

The first general session was held on Friday morning. Raymond Walters, President of the University of Cincinnati, welcomed the Society to the City and to the University. President Doherty delivered his presidential address, "The Engineering Profession Tomorrow." Treasurer J. S. Thompson presented the report of the auditor, H. E. Daer, and Secretary F. L. Bishop read his report by title. Both reports are to be published. The following Committee on Resolutions was appointed: L. A. Rose, Michigan College of M. & T., Chairman, W. A. Murray, University of Virginia, C. L. Eckel, University of Colorado, N. C. Ebaugh, University of Florida, and J. B. O'Farrell, The City College of New York.

The second general session was held in the Wilson Auditorium of the University of Cincinnati on Friday afternoon with Vice President A. R. Cullimore presiding. R. C. Gowdy, University of Cincinnati, spoke on "Selection and Guidance Aspects of Cooperative Engineering Education." R. L. Sackett, Pennsylvania State College, and K. W. Vaughn, Director of the project, reported on the "Measurement and Guidance Project of S.P.E.E., E.C.P.D.-Carnegie Foundation." R. H. Frazier, Massachusetts Institute of Technology, spoke on "Comprehensive Examinations." Ivan C. Crawford, University of Michigan, and G. F. Bateman, Cooper Union, discussed the above.

The third general session was held Saturday morning with President Doherty presiding. H. P. Hammond, Pennsylvania State College, Chairman of the Committee on Engineering Education After the War, summarized the report. The report was discussed by H. S. Rogers, Polytechnic Institute of Brooklyn, W. E. Wickenden, Case School of Applied Science, P. T. Norton, Virginia Polytechnic Institute, G. U. Cleeton, Carnegie Institute of Technology, K. O. Thompson, Case School of Applied Science, H. E. Wessman, New York University, N. B. Obouhoff, Oklahoma A. & M. College. The Society passed a resolution of thanks and appreciation for the leadership, the unflagging devotion and energy, the tolerance and the coöperation which H. P. Hammond has exhibited in this report.

The annual dinner was held Saturday evening in the Hall of Mirrors of the Netherland Plaza Hotel, President Doherty presiding. F. V. Geier, President of the Cincinnati Milling Machine Company, gave the address. D. S.

Bridgman, Chairman of the Committee on Lamme Award, presented Hardy Cross, Professor of Civil Engineering at Yale University, as the seventeenth recipient of the award. The medal was awarded him for the development of revolutionary methods of analysis in structural engineering; for his application of these methods to the rigorous training of civil engineering; for his insistence on the great responsibilities of the individual teacher and his scorn of the superficial in education; for his preëminence in building men who are carrying forward his own high standard of straight hard thinking in the teaching and practice of engineering.

D. C. Jackson, Chairman of the Nominating Committee, presented the following names for officers for 1944–45 and members of Council for three years. Upon motion they were elected.

For President, H. S. Rogers, Polytechnic Institute of Brooklyn

For First Vice President: N. W. Dougherty, University of Tennessee

For Second Vice President: H. M. Crothers South Dakota State College

For members of Council:

H. O. Croft, University of Iowa

R. A. Deller, Bell Telephone Labs.

F. W. Garran, Thayer School of Engineering

A. F. Greaves-Walker, North Carolina State College

E. A. Loew, University of Washington

F. C. Vilbrandt, Virginia Polytechnic Institute

W. C. White, Northeastern University

President-Elect Rogers, when introduced, said: "I am conscious of the high honor that is extended to the office of the President of this great Society. I know something about its illustrious history, with its beginning in Chicago 51 years ago. My first contact with the Society was with my interest in the C. R. Mann report written during the last World War. I know of the rapid growth and development of this Society during the 20's. All of us are aware of the significance of that magnificent report written by Wickenden and Hammond during the 20's which gave us a national vision of engineering education we had not previously held, and which remains today as a source of information for engineering education. I am aware of the part that the Society played in the organization of the E.C.P.D. and of those things which led up to the writing of the fundamental report in 1940. And I am conscious of the things behind this report which was presented in 1944 which opens a wider vision and a great challenge to the Society.

"I recall the traditions of leadership which we have had from the presidents of this Society, from Doherty and Heald, and Prentice, and Hammond, and Wickenden, and Potter, and Jackson, and Scott, and those men who are illustrious in the halls of engineering education.

All of this leaves me deeply conscious of the responsibility of the President of this Society, and particularly am I conscious of this when I look forward to the problems of the year ahead. So I can only pledge to you in deep humility that I shall do all within my power to carry on the work of the Society in conformity with and on a level with its traditions of achievement.

"I feel humble and self-conscious. I was not aware that my selection was determined by geographical conditions but I have felt self-conscious when I

have thought of the fact that I began my career as I left the University of Wyoming, that highest institution of learning in America, 7,200 feet above sea level, and slid through a half a dozen institutions first on the Pacific Coast, then on the Atlantic Coast, back to the Pacific Coast, and then back to the Atlantic Coast again where I live in the shadow of a tree in Brooklyn."

The fourth general session was held on Sunday afternoon with Vice President Gilkey presiding. Major Albert J. Stowe of the Intelligence Division of the Army spoke on Wartime Conversations. A. A. Potter, Chairman-Elect of the Division of Administrative Officers of Engineering Colleges, presented a resolution which had been adopted by that Division earlier, and which was adopted by the Society. (See minutes of Council meetings for resolution.) The Committee on Resolutions presented the following which were unanimously adopted by a rising vote:

The Society for the Promotion of Engineering Education, at its fifty-second annual meeting, hereby adopts the following resolutions:

To the host institution, the University of Cincinnati, we express our gratitude for its courtesy, its friendliness, its unfailing anticipation of our wants and wishes.

To Professor R. A. Anderegg and his committee on arrangements we express our thanks for their indispensable aid in making our visit at once pleasurable and profitable.

To Mrs. C. A. Joerger and the other members of the Women's Hospitality Committee we express our thanks for having translated the name of their group into actuality through the enjoyable trips and social functions which they have provided for the women delegates and guests.

Because of our lively realization of the difficulties under which they labor in the present emergency, we thank the manager and staff of the Netherland Plaza Hotel for coöperation much beyond that which they had obligated themselves to give.

And to the officers of the Society, the members of the Council, the officials of the many conferences, and the participants in those conferences, we extend our appreciation for a program commensuate in scope and value with the magnitude of the tasks entrusted to us by the engineering profession and by society.

(signed) L. A. Rose,
C. L. Eckel,
J. B. O'Farrell,
W. A. Murray,
N. C. Ebaugh.

The meeting adjourned *sine die* to meet in St. Louis, June 21–24, 1945.

F. L. Bishop, *Secretary*

New Members Elected at Meeting

Adams, Lyndon O., Administrative Assistant, Northwestern University, Evanston, Ill. F. C. Seulberger, B. H. Jennings.

Albright, John G., Professor and Head, Dept. of Physics, Rhode Island State College, Kingston, R. I. T. S. Crawford, R. L. Wales.

Barre, Henry J., Professor and Head, Dept., Agricultural Engineering, Purdue Univ., Lafayette, Ind. A. A. Potter, L. J. Fletcher.

Bliss, John C., Dean, School of Engineering, Robert College, Istanbul, Turkey. W. R. Bryans, C. E. Gus.

Bock, Arthur E., Assistant Professor of Mechanical Engineering, Virginia Poly. Inst., Blacksburg, Va. J. B. Jones, Louis O'Shaughnessy.

BOWE, ALEXANDER J., Assistant Professor of Highway Engineering, Massachusetts Institute of Technology, Cambridge, Mass. J. B. Babcock, C. B. Breed.

BONILLA, CHARLES F., Associate Professor and Acting Head, Dept. Chemical Engineering, Johns Hopkins University, Baltimore, Md. W. B. Kouwenhoven, A. G. Christie.

BRUNER, WARREN D., Coördinator of Cadette Training, Curtiss-Wright Corp., Buffalo, N. Y. W. C. Nelson, H. P. Hammond.

CARLSON DEVON M., Instructor in Engineering Drawing, University of Colorado, Boulder, Colo. Warren Raeder, F. S. Bauer.

CHASE, CARL T., Assistant Professor of Physics, Exec. Sec., Dept., New York Univ., New York City. Thorndike Saville, W. R. Bryans.

CLAYTON, CHARLES Y., Professor of Metallurgical Engineering, Missouri School of Mines, Rolla, Mo. A. C. Callen, R. T. Gallagher.

COAN, JOHN M., Assistant Professor of Aeronautical Engineering, Iowa State College, Ames, Iowa. W. C. Nelson, H. J. Gilkey.

DANGEL, HERBERT A., Associate Professor of Mathematics, University of Cincinnati, Cincinnati, Ohio. Nell McKenry, C. L. Svensen.

DOBBINS, GEORGE S., Assistant Professor of Engineering Drawing and Machine Design, Univ. Col., Boulder, Colo. Warren Raeder, F. S. Bauer.

FENTON, FRED C., Professor of Agricultural Engineering, Kansas State College, Manhattan, Kansas. Re-instatement. R. A. Seaton, L. J. Fletcher.

FOGARTY, WILLIAM P., Professor of Engineering, St. Francis Xavier Univ., Antigonish, N. S. F. L. Bishop, Nell McKenry.

GERHARDT, HERMAN O., Instructor in Technical Drawing, Illinois Institute of Tech., Chicago, Ill. H. L. Henry, R. C. Kintner.

GRAWE, OLIVER R., Associate Professor of Geology, Missouri School of Mines, Rolla, Mo. Clair V. Mann, I. H. Lovett.

GRIFFIS, LEVAN, Associate Professor of Mechanics, Illinois Institute of Technology, Chicago, Ill. L. E. Grinter, R. C. Kintner.

GUEST, C. BOYD, Professor and Chairman, Dept. of English, Missouri School of Mines, Rolla, Mo. A. C. Callen, R. T. Gallagher.

GUILLEMIN, ERNST A., Professor of Electrical Communications, Massachusetts Institute of Technology, Cambridge, Mass.

HIRST, JOHN M., Instructor in Electrical Engineering, Thayer School of Engineering, Hanover, N. H. F. W. Garran, S. Schutz.

HOBBS, RANALD P., Manager, Radio and Technical Div., Murray Hill Books, Inc., 232 Madison Ave., N. Y. C. 16. J. S. Thompson, F. L. Bishop.

HOSHALL, HARRY B., Assistant Professor of Mechanical Engineering, Univ. of Maryland, College Park, Md. R. B. Allen, J. E. Younger. 1930-

HYNES, ROBERT D., Assistant Dean, Evening College, University of Cincinnati, Cincinnati, Ohio. F. L. Bishop, Nell McKenry.

JACOBS, L. S., Captain of Yard's Office, Navy Number 128, c/o Fleet P.O., San Francisco, Calif. F. A. Smutz, M. A. Durland.

JONES, ELTON W., Instructor in Alternating Currents, Harvard University, Cambridge, Mass. C. L. Dawes, Albert Hanstein.

JONES, FRED R., Professor of Agricultural Engineering, A. and M. College, College Station, Texas. C. E. Sansdedt, L. J. Fletcher.

KALELKAR, BAL D., Instructor in Mechanics, Cornell University, Ithaca, N. Y. C. O. Mackey, P. H. Black.

KENNER, CHARLES A., Professor of Electrical Engineering, University of Illinois, Urbana, Ill. A. R. Knight, P. F. Schwarzlose.

KIMBALL, ROBERT M., Assistant to President, Massachusetts Institute of Technology, Cambridge, Mass. R. S. Williams, J. R. Killian.

KINDLE, JOSEPH H., Professor of Mathematics, University of Cincinnati, Cincinnati, Ohio. G. T. Addison, R. A. Anderegg.

LARSON, EDWARD, Executive Secretary, National Society of Professional Engineers, National Press Bldg., Washington, D. C. C. F. Scott, H. E. Nold.

LISTON, JOSEPH, Associate Professor of Aeronautical Engineering, Purdue University, Lafayette, Ind. J. S. Thompson, A. A. Potter.

LIVINGSTON, ARNOLD R., Instructor in Engineering Drawing, Iowa State College, Ames, Iowa. T. R. Agg, O. A. Olson.

LOFLIN, ZEKE L., Professor of Chemical Engineering, Southwestern Louisana Institute, Lafayette, La. G. G. Hughes, F. W. zur Burg.

MATHIESEN, JOHN T., Instructor in Geography, Michigan College M. & T., Houghton, Mich. E. L. Wood, A. K. Selgrove.

MCDONALD, FREDERICK J., Instructor in Engineering, St. Mary's College, Winona, Minn. H. C. Spencer, B. O. Loving.

MCGAW, ALEX J., Professor of Civil Engineering, University of Wyoming, Laramie, Wyo. H. T. Person, R. D. Goodrich.

MICHALOWICZ, JOSEPH C., Instructor in Electrical Engineering, Catholic University of America, Washington, D. C. T. J. MacKavanaugh, E. A. Valade.

MOORE, HOLLISTER, Staff Representative, Student Activities, Society of Automotive Engineers, Inc., 351 Morris Ave., Mountain Lakes, N. J., H. M. Barlow, Walter Bishop.

MUMMERT, HAROLD B., Assistant Professor of Engineering, Valparaiso University, Valparaiso, Ind. D. D. Mallory, H. W. Moody.

NACHAZEL, JULIUS T., Assistant Professor of Mathematics, Michigan College of M. and T., Houghton, Mich. James Fisher, W. A. Longacre.

PERETTI, ETTORE, A. J., Assistant Professor of Metallurgy, Columbia University, New York City. T. T. Read, P. S. Bucky.

PIUS, BROTHER LUCIUS, Head, Engineering Drawing Dept., St. Mary's College, Winona, Minn. H. C. Spencer, B. O. Loving.

PRICE, FREDERICK E., Professor of Agricultural Engineering, Oregon State College, Corvallis, Ore. C. A. Mockmore, L. J. Fletcher.

PRICE, REGINALD C., Assistant Professor of Engineering, New York University, New York City. D. B. Porter, Thorndike Saville.

RICH, NATHAN H., Instructor in Mechanical Engineering, Thayer School of Engineering, Hanover, N. H. F. W. Garran, J. H. Minnick.

RICH, RONALD E., Professor and Head, Dept. of Chemical Engineering, Univ. of Notre Dame, Ind. Re-instatement.

SCHART, WILLIAM J., Signal Training Administrator, San Bernardino Air Service Command, 412 W. Olive Ave., Redlands, Calif. J. S. Scheinman, F. F. Meyer.

SCHOOLER, DURWARD R., Assistant Professor of Drawing, Missouri School of Mines, Rolla, Mo. Clair V. Mann, I. H. Lovett.

SMITH, EDWARD S., Professor of Mathematics, University of Cincinnati, Cincinnati, Ohio. R. A. Anderegg, Nell McKenry.

SMITH, HOMER P., Member, Labs. Staff, Tech. Employment Dept., Bell Telephone Labs., 463 West St., N. Y. C. R. A. Deller, R. J. Heffner.

SMITH, LEO F., Associate Supervisor, Evening School, Rochester Athenaeu and Mechanics Inst., Rochester, N. Y. John T. Faig, M. B. Robinson.

TERRELL, WENDELL P., Assistant in Mechanical Dept., National Bureau of Standards, 1505 Tea St., N.W., Washington 9, D. C. R. A. Seaton, M. A. Durland.

THOMAS, EUGENE M., Dean of Engineering, Texas College of Mines and Metalurgy, El Paso, Texas. A. C. Callen, R. T. Gallagher.

TOUR, R. S., Professor of Chemical Engineering, University of Cincinnati, Cincinnati, Ohio. S. B. Arenson, E. E. Booher.

VON ESCHEN, GARVIN L., Associate Professor of Aeronautical Engineering, University of Minnesota, Minneapolis, Minn. J. D. Akerman, H. C. T. Eggers.

WATERS, ERNEST W., Technical Employment Dept., Bell Telephone Labs., 463 West St., New York City 14. R. A. Deller, R. J. Heffner.

WEBER, PAUL, Professor of Chemical Engineering, Georgia School of Technology, Atlanta, Ga. Re-admission.

WIGGINS, D. M., President, Texas College of Mines and Metallurgy, El Paso, Texas. A. C. Callen, R. T. Gallagher.

WILL, ROY T., Supervisor, College Level Training, Consolidated Vultee Aircraft Corp., Forth Worth 1, Texas. H. E. Degler, M. V. Barton.

WILLIAM, REX Z., Associate Professor and Chairman, Dept. of Mechanics, Missouri School of Mines, Rolla, Mo. A. C. Callen, R. T. Gallagher.

Associate Institutional Membership: Southwestern Louisiana Institute, Lafayette, La. G. G. Hughes, Dean.

63 Individual + 1 Institutional Member
280 Previously elected

343 new members 1943–44

Report of the Secretary, F. L. Bishop, 1943-44

The Council, by letter ballot, approved the following during 1943–44:

1. Eleven lists of applicants for membership.
2. Model law for registration of professional engineers and land surveyors for the certification of engineers-in-training.
3. Minutes of Council meetings, June and October, 1943.
4. Report of Committee on Credits for In-Service Study.

President Doherty, on April 15, 1944, gave a report to the members of the Society on the principal problems facing engineering education and on what the Society is doing about them. Topics included were A.S.T.P., Selective Service deferments, education for returning veterans, universal military service, government surplus property as a possible source of apparatus for engineering colleges, training of foreign students in engineering, and the work of the Committee on Engineering Education After the War. This report was mailed to all members of the Society and you have a copy before you. In view of this report, I will not discuss these questions but will confine my report to those factors which may be useful to members of the Council in fixing the policies for the coming year.

Membership.—The increase in membership has been gratifying. The growing interest in the Society has been maintained during the current year in spite of the war. This is shown by the many letters which come to the Secretary's office expressing appreciation of the work of the Society and specifically by the large number who have paid back dues in order to retain their membership. Several who were dropped for non-payment of dues immediately sent their checks for the full amount in order to retain their membership. One individual, who had never been a member but who had attended one of our summer schools in 1930, made application this year for membership. He wrote that he had intended to join in 1930 but had put off doing so year after year until now he felt so obligated to the Society that he enclosed a check for $75.00 for dues from 1930 to 1945! We now have 3,700 individual members, 141 active and 19 associate institutional members, a grand total of 3,860. 82 have been dropped for non-payment of dues. 61 resigned, and we have lost 20 by death. Our records show 219 in military service. There are undoubtedly others who have not notified the office.

Committees.—Credit for In-Service Study—O. J. Ferguson, Chairman. The report of this Committee was approved by Council and published in the November JOURNAL.

Engineering Education After the War—H. P. Hammond, Chairman. This report was published in the May 1944 JOURNAL and will be presented at the general session on Saturday June 24. Through the efforts of President Doherty, the Society received $1,500 toward the work of this Committee from Carnegie Foundation.

A.S.T.P. and N.C.T.P.—Robert E. Doherty, Chairman. This Committee

held four meetings, one in Chicago, two in Pittsburgh, and one in Washington. These meetings were followed by conferences by the Chairman with those in charge of these services in Washington.

Government Surplus Property—C. E. MacQuigg, Chairman. This Committee has made satisfactory progress and will report at this meeting.

Humanistic-Social Studies—W. E. Wickenden, Chairman. The preliminary program for this meeting announced a conference on Saturday morning on this subject. It seemed advisable to postpone the conference until early fall. Through the activities of Dr. Wickenden, the Rockefeller Foundation appropriated $1,800 for this conference.

Measurement and Guidance Project —K. W. Vaughn, Director. Council last June approved the plan by which this Society would coöperate with the Carnegie Foundation for the Advancement of Teaching and the Engineers' Council for Professional Development on this project. Later the Executive Committee granted $300 towards the work. The reports of this study are appearing in the JOURNAL.

Sections and Branches.—H. J. Gilkey, Chairman. This Committee has coöperated with the Engineers' Council for Professional Development in its work on student guidance and professional recognition.

Conferences.—A. R. Cullimore, Chairman. The work of this one-man Committee speaks for itself when you read the program of conferences.

The other committees, divisions, sections and branches have all worked very energetically during the year. The Society is indeed fortunate in having so many members working for it through these groups.

The Society is a sponsor, without financial responsibility, of the Program for Post-War Traffic Safety conducted by the National Safety Council.

E.C.P.D.—The Society again contributed $500 to E.C.P.D. for the work of the Committee on Engineering Schools.

Joint Meetings.—This year we are having joint meetings with the American Society of Agricultural Engineers, L. J. Fletcher, Chairman; American Association of Physics Teachers, J. G. Potter, Chairman; and Engineering College Research Association, W. R. Woolrich, Chairman.

The Journal of Engineering Education.—The paper shortage has caused us some trouble leading to a reduction of the number of pages in the JOURNAL and the use of a different and somewhat lighter paper. Unless there is another cut we should have enough paper for next year.

Administrative Division:

It was deemed advisable in April, when drastic changes were being made in the A.S.T.P. and Selective Service, to send telegrams to the deans and the presidents of all engineering colleges. The spirit of coöperation shown by the replies was very gratifying. Copies of this and other telegrams are attached to this report.

At the request of the Director of the A.S.T.D. a tentative draft of a curriculum designed to train men to fill positions in the aeronautical industry was sent to various institutions. The replies were analyzed and forwarded to the A.S.T.D. No further action has been taken.

These matters seem simple when tabulated in this way but back of this is the large amount of time which

President Doherty has spent in Washington.

Day Letter Sent April 8, 1944:

S.P.E.E. strongly recommends that you prepare four copies of transcript of deferred students who are inducted. Transcripts bear your recommendation as to A.S.T.P. term student should enter if returned to college. Give student two copies. You keep two, one for your files, one for service command when requested.

Telegram April 20, 1944:

Please wire immediately: 1. Estimate number students still in class eligible to enter A.S.T.P. term 4 or 5 in electrical, civil or mechanical engineering. 2. Your estimate rate at which they would be inducted. 3. Number of 4-F's you have.

117 institutions reported as follows:

1. Students eligible to enter A.S.T.P. term 4 or 5: 5,164.
2. Rate of induction—average 60 days.
3. Number of 4-F's: 2,624.

Letter August 13, 1943:

Colonel Beukema, Director of A.S.T.P., has asked us to transmit to you the enclosed tentative draft of a curriculum designed to train men to fill technical positions in the aeronautical industry. We are asking you to study this carefully and to send to this office your comments and suggestions in regard to this curriculum. An immediate reply is important in order that this work, if undertaken in the engineering colleges, may be put into force promptly.

The construction of final drafts is dependent upon the adoption and operation of the plan to train men for industry, a decision yet to be made. *. . . It is very important that there be no misconception with regard to the present status of this proposed program.*

Letter November 24, 1943, to Honorable Elbert D. Thomas, U. S. Senator.

The engineering colleges of this country are represented by the S.P.E.E. At a meeting of deans and presidents of these colleges in Chicago, October 25, 1943, the enclosed resolutions were adopted. It was suggested to me that you would be interested in these resolutions.

Resolutions.—The Council of the Society for the Promotion of Engineering Education, in recognition of the fact that instruction in engineering and related sciences will comprise a large and important portion of the postwar education of returning veterans, and that policies governing any national program of higher education for veterans are of great importance, recommends.

1. That the agency to be charged with the administration of such a program deal directly with the colleges and universities in which such training will be conducted and not through agencies of the several states.

2. That there be established committees in the several fields of higher education to service, without compensation, in an advisory capacity to the administrating Federal agency to the end that these problems peculiar to each such field shall be considered by groups preëminently qualified to present experienced judgment on such matters.

3. That based on the very satisfactory experience of the engineering col-

leges conducting war training courses under the auspices of the U. S. Office of Education, it is felt that the general administrative policies and organization so successfully employed by this Agency be used as a prototype for administration of Federal participation in postwar education.

4. That the practice of the U. S. Office of Education of employing experienced engineering college educators and administrators in key positions on its administrative staff be adopted by any Federal agency charged with administering the program of higher education for returning veterans involving engineering and related sciences.

Report of Treasurer, 1943–44*

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION
STATEMENT OF CASH ACCOUNT
June 10, 1944

	1942–43 (June 10, 1943)	1943–44 (June 10, 1944)
BALANCE ON HAND:		
Forbes National Bank—Checking Account	$ 6,847.52	$ 9,053.19
Forbes National Bank—Savings Account	7,993.99	536.63
Total Balance	$14,841.51	$ 9,589.82
RECEIPTS:		
Current Dues	$14,727.89	$16,786.30
Back Dues	1,916.00	2,305.25
Dues in Advance	527.50	247.50
Sales of Publications	494.81	745.93
Advertising	2,890.74	3,820.47
Sale of Emblems	115.00	242.05
Refund from Lamme Award	191.00	—
Interest on Savings Account	42.64	5.69
Interest on Government Bonds	—	187.50
Refund from Committee on English	5.16	—
Gift for use of Administrators Division	80.00	—
Gift from Carnegie Foundation for Committee on Engineering Education after War	—	1,500.00
Gift from Rockefeller Foundation for Conference on Social Humanities Problems	—	1,800.00
Total Receipts	$20,990.74	$27,640.69
DISBURSEMENTS:		
Cost of Publications	$ 7,828.43	$ 8,561.24
Cost of Proceedings	142.41	248.04
Honorarium for Secretary	2,000.00	2,000.00
Clerical Assistance	4,000.00	4,000.00
Travel and Entertainment—Secretary's Office	399.31	429.15
Committee Expenses	263.79	35.76
Expenses—Committee for Acceleration of Engineering Program	8.90	—
Officers' Traveling Expenses	33.64	105.39
Printing, Postage, Office Supplies, etc.	1,628.26	1,500.19
Expenses—1942 Meeting	238.94	—
Expenses—1943 Meeting	221.01	297.80
Expenses—1944 Meeting	—	391.58
Dues—American Council on Education	100.00	100.00
Contribution to Engineers' Council for Professional Development	250.00	750.00
Expenses—Division of Mechanics	184.98	21.15
Expenses—Administrators Division	1,019.40	178.58
Expenses—Army Advisory Committee	352.21	—
Expenses—Army Specialized Training Program	71.15	908.95
Expenses—Committee on Engineering Education after War	—	1,714.15
Expenses—Committee on Credits	—	100.57
Expenses—Conference on Social Humanities Problems	—	29.00
Disbursement for purchase of Series "G" Government Bonds	7,500.00	—
Contribution to Measurement and Guidance Project	—	300.00
Disbursement for Lamme Award	—	191.49
Purchase of Emblems	—	569.66
Total Disbursements	$26,242.43	$22,432.70

* Audited by H. E. Daer.

BALANCE ON HAND:		
Forbes National Bank—Checking Account	$ 9,053.19	$14,161.74
Forbes National Bank—Savings Account	536.63	636.07
Total Balance on hand	$ 9,589.82	$14,797.81

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION
COMPARATIVE INCOME AND EXPENSE STATEMENT
For the Years Ending June 30, 1943 and 1944
(Prepared June 10, 1943 and 1944)

EXPENSE

	1942–43	1943–44
Cost of Publications	$ 7,928.43	$ 9,061.24
Cost of Proceedings	142.41	248.04
Expenses—1942 Meeting (1943)	944.92	518.81
Honorarium for Secretary	2,000.00	2,000.00
Clerical Assistance	4,000.00	4,000.00
Printing, Postage, Office Supplies, etc.	1,628.26	1,500.19
Travel and Entertainment, Secretary's Office	399.31	429.15
Committee Expenses	263.79	35.76
Expenses—Committee for Acceleration of Engineering Program	8.90	—
Officers' Traveling Expenses	33.64	105.39
Dues—American Council on Education	100.00	100.00
Contribution to Engineers Council for Professional Development	250.00	750.00
Expenses—Division of Mechanics	184.98	21.15
Expenses—Administrators Division	1,019.40	178.58
Expenses—Army Advisory Committee	352.21	—
Expenses—Army Specialized Training Program	71.15	908.95
Cost of Emblems	—	569.66
Contribution to Measurement and Guidance Project	—	300.00
Expenses—Committee on Credits	—	100.57
Expenses—Committee on Engineering Education after War	—	1,714.15
Expenses—Conference on Social Humanities Problems	—	29.00
Total Expense	$19,327.40	$22,570.64
Surplus for the Year	1,850.84	3,688.05
	$21,178.24	$26,258.69

INCOME

	1942–43	1943–44
Current Dues	$15,792.89	$18,313.80
Back Dues	1,116.00	1,405.25
Sales of Publications	494.81	745.93
Advertising	3,531.74	3,829.47
Sales of Emblems	115.00	242.05
Interest on Savings Account	42.64	5.69
Interest on Government Bonds	—	187.50
Refund—Committee on English	5.16	—
Gift for Use of Administrators Division	80.00	—
Gift from Carnegie Corporation (used)	—	1,500.00
Gift from Rockefeller Foundation (used)	—	29.00
Total Income	$21,178.24	$26,258.69
	$21,178.24	$26,258.69

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION
COMPARATIVE BALANCE SHEET
June 30, 1943 and 1944
(Prepared June 10, 1943 and 1944)

ASSETS

	1943	1944
Cash:		
Current Fund	$ 9,053.19	$14,161.74
Petty Cash Fund	300.00	300.00
Life Membership Fund	902.24	915.83
Savings Account	536.63	636.07
Total Cash	$10,792.06	$16,013.64
Securities:		
United States Government Bonds—Series "G"	$ 7,500.00	$ 7,500.00
Benj. G. Lamme Trust Fund		
Securities and Mortgages	$ 4,866.88	$ 4,866.88
Uninvested Cash	249.25	249.25
Checking Account	149.63	112.77
Total Lamme Fund	$ 5,265.76	$ 5,228.90
Prepaid Expenses: 1943 Meeting (1944)	$ 221.01	$ 391.58
Inventory (Nominal)	1.00	1.00
Accounts Receivable:		
Advertising	991.00	1,000.00
Dues	900.00	1,000.00
Benj. G. Lamme Award	—	191.49
Furniture and Equipment (Nominal)	100.00	100.00
Total Assets	$25,770.83	$31,426.61

LIABILITIES

	1943	1944
Life Membership Fund	$ 902.24	$ 915.83
Benj. G. Lamme Trust Fund	5,265.76	5,228.90
Prepaid Membership Dues	527.50	247.50
Accounts Payable	800.00	1,300.00
Gift by Rockefeller Foundation (Unused)	—	1,771.00
Total Liabilities	$ 7,495.50	$ 9,463.23

SURPLUS ACCOUNT

Balance	$16,424.49	$18,275.33
Surplus for Year	1,850.84	3,688.05
Total Surplus	$18,275.33	$21,963.38
Total Liabilities and Surplus	$25,770.83	$31,426.61
	(June 10, 1943) 1942–43	(June 10, 44) 1943–1944

Report of the Committee on Engineering Education After the War

Summary

H. P. Hammond, Chairman (The Pennsylvania State College): The report of this committee was written during the period of most drastic change in engineering education that has ever occurred. Enrollments of civilian students were being rapidly reduced; faculties were being depleted; normal programs were being replaced by military and industrial training programs, and these, in turn, were being changed with bewildering rapidity.

Not only were conditions in education changing, but, in a broader sense, it is clear that the era in which we are living marks one of the great turning points in human affairs. We may be too close to it to comprehend fully all its portents, but we have only to summarize events of the past thirty years to realize that they are bound to exert important influences on education sooner or later. Not only has this era included the two most calamitous wars of modern times, but it has also witnessed the most violent swing from inflation to depression and unemployment. It has seen the growth of the totalitarian concept of state and society, the inevitable collision of that idea with the democratic concept, and the struggle between the two for survival. It has been marked by cleavage between social groups—proletriat against bourgoise, labor against capital—and other manifestations of a social order in a state of unrest and transition. In the realm of government, we are witnessing a trend from administration by process of law to one by executive order. And we as engineers do not need to be reminded of the unprecedented rate of increase in the developments of science and engineering and their effects to realize how great a change there has been during the past generation in industry and government, as well as in economic and social concepts.

It was against this background that this committee was given its assignment of considering engineering education in the light of the great changes that are taking place. The committee was directed to indicate the problems that are arising out of the war and will need soon to be solved, and what more fundamental changes, if any, ought to be made in the structure of engineering education to adapt it to the altered conditions about us.

Four years previously another committee of this Society had presented a report of fundamental nature on the aims and scope of engineering curricula. The present committee was directed especially to consider the recommendations of that report in the light of conditions now prevailing.

The most general single statement that we can make in summarizing the present report is that we find the general conclusions and recommendations of the Report of 1940 to be sound and applicable to engineering education under future conditions, as far as we

can envisage them. Our committee has therefore devoted its attention principally to concepts and principles on which we conceive these recommendations to be based and especially to suggestions for carrying them into effect.

Purposes and Organization of the Curriculum.—The first of these recommendations relate to the purposes and organization of the curriculum and are as follows:

(1) That the 4-year undergraduate curriculum be retained as the norm for the majority of engineering students.

(2) That curricula be organized in parallel articulated sequences of scientific-technological and humanistic-social studies extending throughout the undergraduate period, each planned for the achievement of clearly specified goals. These are defined in the Report of 1940 and reiterated in the Report of 1944. In brief, these goals are:

(a) *For the scientific-technological stem,* acquirement by the student of mastery of the basic principles, assumptions, empiricisms, and codes of practice which constitute the subject-matter of engineering study, accompanied by acquisition of the ability to apply them to problems of practice which constitute the engineering method.

(b) *For the humanistic-social stem,* development of the ability to read, write, and speak the English language effectively; to understand, analyze, and express the essentials of an economic, social, or humanistic situation or problem; and to appreciate its implications and relationships to the life and work of an engineer. There is also the goal of development of an adequate concept of the duties of citizenship in a democratic society; an acquaintanceship with the enduring ideas and aspirations which men have evolved as guides to ethical and moral values; and an appreciation of cultural interests lying outside the field of engineering.

In addition to organization of curricula for the achievement of these goals the committee calls attention to two recent trends in engineering and industry for which provision should be made in educational programs.

One of these trends is the rapid increase in the application of the engineering method to the management and operation of industry as is evidenced by the phenomenal success of graduates in these activities. The other is the greatly increased need for engineers equipped to practice at high scientific and creative level. The remark was made recently by an engineer having unusual knowledge of technical developments during the war, that if engineers are not to be equipped to work on new developments at high creative level, physicists are likely to take over the designing of the devices which will use the scientific principles they are discovering—as indeed they are already doing in some instances.

In order to provide for the satisfaction of the needs incident to these trends, the committee suggests, for consideration, a plan of curricular differentiation in the fourth year, through which three options would be offered within each major professional curriculum:

(1) Continuation of the present type of 4-year program essentially

as a terminal curriculum, but with modifications advocated by the committee, for a majority of students.

(2) An alternative fourth year emphasizing subjects dealing with the management of construction and production enterprises.

(3) A fourth year intended to prepare for additional years of advanced study by strengthening the student's command and extending his knowledge of basic sciences and mathematics, and by introducing him to the methods of advanced study. This fourth year and the year or years of graduate study to follow would be planned as a unit rather than as two stages marked by the usual differences of undergraduate and postgraduate programs.

Trial arrangements of curricula indicate the practicability of such functional differentiation of programs.

Allotment of Time.—From the formulation of the goals of engineering study the committee turns to the methods, concepts, and principles of achieving them which constitute the chief substance of its report. Unfortunately, the scope and variety of the topics discussed are such that it is impossible to deal with them adequately in this brief summary. Certain phases of the report have been selected, therefore, and will be presented as important matters for further discussion today.

First among these is the important and vexing problem of the allocation of time to the two major sequences of courses comprising the curriculum. It is clearly understood, of course, that the preponderant allotment of time must be made to the dominant scientific-technological sequence, but it is recognized also that sufficient time must be devoted to humanistic-social studies if the objective of producing well educated engineers is to be realized. In order to insure this result the committee recommends that the allotment to humanistic-social courses, not including drill courses in English Composition, be not less than one 3-credit course in each of the eight semesters, or approximately one-fifth of the entire curriculum.

In order to provide this allotment of time and in view of the overcrowded condition of the curriculum as a whole, the committee recommends that only those courses and subject matters be retained which are clearly related to the formulated purposes of the curriculum and which the student can master and use with certainty in new situations when he encounters them. This will require careful pruning to essential principles, methods, and data, and it will also require the transfer to post-graduate years of some of the more advanced subject matters now included in undergraduate years. The committee believes that the results of these changes will be a great improvement in the quality of instruction all along the line.

To express my own opinion on this matter somewhat more pointedly, I believe the most serious fault of engineering education is the lack of thoroughness which results from the crowding of so much material into the curriculum that it is beyond the capacity of even the ablest students properly to assimilate and master it. I once had a very able student who actually attempted to do *all* that was required of him according to the standards of thoroughness to which he had been accustomed in previous experience in engineering

practice. He broke down under the strain.

Organization of the Humanistic-Social Stem.—Since this portion of the curriculum has not as yet been placed on an organized basis comparable with the scientific-technological portion, the committee presents a number of suggestions in planning humanistic-social studies that seem likely to assure effective results. These are merely listed below but are amplified in the report:

(1) Establish responsibility for planning and coördination of subject matter.

(2) Formulate the results sought as explicitly as possible.

(3) Discriminate between humanistic studies and business training.

(4) Allot time in the more advanced years as generously as possible.

(5) Enrich this area of work by saving time elsewhere in the curriculum.

(6) Use the most skillful teaching available.

(7) Capitalize on the appeal of current interest.

(8) Reinforce required work by voluntary student activities.

In the light of conditions summarized earlier, the committee believes that one of the chief purposes of humanistic-social studies is the development among students of an understanding of the principles of the democratic organization of society and of the republican form of government established to sustain it, knowledge relating to the economics of private and public enterprise, and appreciation of the contributions of science and technology to industrial progress and the common welfare. Subject matters selected for the achievement of these aims are commonly drawn from the fields of history, government, economics, and sociology wherein knowledge is essential to competence as a citizen; and of literature, philosophy, psychology, and fine arts, which afford means of broadening the student's interest and outlook.

However, though the selection of subject matter is important, the devising of suitable methods of instruction is likely to present even greater difficulty than it does in courses in science and engineering. Formal expository methods which are often used usually prove to be less effective than the method of having the student participate in the work by practice on suitable examples and problems and thus to acquire for himself the ability to understand the essentials of an economic, social, or humanistic situation.

Conducting courses in the humanistic-social area by this method will require very careful planning and the selection of teachers who not only have a thorough grasp of the field, but understand its implications for engineers and, above all else, can organize their work so that the students will participate in it and not merely be receptive to didactic instruction.

Organization of the scientific-technological stem requires less comment than the humanistic-social studies, since its organization as an integrated curricular structure is generally understood. Incidentally, this is one of the most valuable attributes of engineering education, which must be retained at all costs.

Two points are worthy of recognition in relation to this asset of engineering education: one, that it can be greatly harmed by the attempt to crowd too much inert subject matter into the program, and the other, that while emphasis must be placed on in-

struction in the principles that underlie engineering practice, related instruction in the art of applying these principles and the assimilation of sufficient factual engineering knowledge, which together form the flesh and blood on the supporting skeleton of principles, cannot be neglected if the program is to be in engineering rather than in pure science.

Methods of instruction appropriate to engineering education, while not susceptible of as definite analysis as curricular organization, have received the attention of the committee. Certain suggestions are advanced which may be found helpful in planning the work of a given course.

(1) Coördinate recitation, laboratory, and design instructional methods wherever possible.

(2) Learning is best achieved by doing; hence, insist upon the student doing things for himself. Avoid turning the recitation into an informal lecture, which is likely to lead to "reciting the lesson for the class."

(3) Deal with students individually as much as possible.

(4) Design each course as an integrated whole leading to the development of explicitly stated objectives.

(5) Acquaint the student with these objectives and the nature and purposes of the course at the beginning and give him opportunity to appraise for himself the achievement of these objectives.

(6) Throughout the curriculum, and especially at the beginning, it is necessary to discipline students in engineering methods of work. Accuracy, neatness, thoroughness, should be constantly stressed so that they become matters of habit.

(7) There should be a gradual transition from closely directed work in the early years of the curriculum to self-directed or semi-independent work toward the end.

(8) Cultivation of creative ability through appropriate use of problems, projects, and the thesis should be an explicitly understood aim of undergraduate instruction.

The committee believes that measurement of student achievement should receive additional attention and that means should be planned for the transition from examinations of the customary type to the solution of more comprehensive problems or projects requiring the application of knowledge and principles drawn from several fields. Such examinations should also test the student's ability quickly to find data needed in his work.

Ideals of the Engineering Profession.—The committee believes that cultivation of the ideals and obligations of the engineering profession should be accepted as an objective of engineering education of the same order of importance as instruction in the principles and methods of engineering practice. Among the characteristics of this process of professional indoctrination are:

(1) Consciousness of the engineering fraternity as a functional group in society engaged in constructive work of a common nature, using a common method of thought, and recognizing common obligations.

(2) Appreciation of the heritage of knowledge and art, of standards of performance, and of traditions of group action for professional development.

(3) Recognition of the confidential relationships between agent and client, of the principles of fair play between colleagues, and of the encompassing social duty to the public of service adequately and honestly given.

(4) The instilling of loyalty to the principles of professional ethics not alone according to the canons in which they have been formulated, but also according to the spirit in which they have been conceived.

(5) Understanding of the obligation of service to the profession in the advancement of its science, technology, and art, and in the discharge of its duplicating broad social duty.

From Dr. Doherty's presidential address it is clear that the organized profession must turn to schools and colleges of engineering to an increasing extent for the attainment of this goal. It seems to the committee that to aid in its accomplishment should be accepted as an opportunity as well as an obligation of this Society.

Sub-Professional Technical Education and Training.—All the foregoing relates to engineering education at collegiate level. It has been said that the development of technical education in this country has been so preponderantly among engineering colleges that the aims, objectives, and purposes of programs of education and training at all levels—secondary, vocational, technical institute, collegiate, and postgraduate have become confused. Of these several divisions of technical education and training, programs of technical institute type are the ones that are less adequately recognized and provided for in comparison with others in this country. Yet it is these programs that bear the closest relationship to professional engineering and should perform the most essential function auxiliary to it. This situation is unique among the great industrial nations of the world. Until the problems of training of technical institute type are solved, the aims and purposes of collegiate engineering education are bound to be obscured. For the benefit of industry and society at large as well as of the engineering profession it is highly desirable, therefore, that there be widespread recognition and development of programs of technical institute type throughout the country.

One step that appears to be essential in this connection, is the provision of means of formal recognition for institutions offering programs of technical institute type and for their graduates. At present, neither the national engineering societies, nor engineering registration boards, nor federal civil service, grant any credit, in evaluating qualifications of individuals, for the completion of educational programs offered by sound institutions operating in this field. The committe believes that industry and the engineering profession should give united support to measures of recognition of sound technical institute programs. These should be similar in general nature but appropriately different in details and operation, to the accrediting procedures of Engineers' Council for Professional Development as to engineering colleges, and to evaluation practice of state boards of engineering examiners as to individuals. The committee believes that such measures of recognition and certification would ultimately bring genuine benefit to colleges of engineering.

To turn now to problems of more immediate importance that are arising out of war conditions, the committee presents a number of recommendations, the most important of which can be assembled in the following four categories:

(1) *Those Relating to Students and Especially to their Selection and Admission.*—The Army and Navy qualifying examinations furnish fac-

tual support for views previously held that there is great need for strengthening secondary school preparation for engineering. It is clear also that more valid and more highly selective methods of selection and admission of students should be adopted by the colleges themselves to the end that their resources shall be devoted more strictly and more effectively than in the past for the benefit of those qualified to pursue an engineering education successfully. Better preparation and more selective methods of admitting students should accomplish as much in clarifying the purposes and improving the quality of engineering education as could any other measures that might be undertaken.

The evidence obtained in the Army and Navy tests should therefore be disseminated widely and testing procedures now being developed through the project sponsored jointly by Engineers' Council for Professional Development and this Society should be applied promptly and widely as soon as they are ready to aid in accomplishing this result.

(2) *Those Relating to Returning Veterans.*—The committee feels that policies adopted in this connection should be as liberal as possible without sacrificing sound educational standards or jeopardizing the interests of the individuals themselves. A variety of expedients, such as special adjustment terms, will be needed to adjust veterans to regular curricula as quickly as possible. The services of engineering colleges may be needed to provide short, intensive courses for those who do not desire to follow complete degree programs. While this may be necessary as an emergency measure, it should not become a permanent function of engineering colleges and thereby tend to confuse their major purposes.

(3) *The Question of Continuation of the Accelerated Program.*—While this is not wholly a one-sided matter, particularly since it may be influenced by universal military service, the committee is of the opinion that the early resumption of the customary two-semester or three-term calendar is to be preferred to year-round operation. Coöperative curricula, of course, will remain an exception in this matter.

(4) *Problems in Relation to the Rehabilitation of Faculties.*—This is one of the most vital of all problems confronting engineering education today. Many of the ablest men are on special war services and some are on loan to industry or enforced leaves of absence; there will be serious problems of reassimilation and readjustment for some of these men. Those still on the job are in need of recuperation from the long continuous grind under overload. These and other problems will require the most thoughtful consideration that can be devoted to them by all concerned, for the present situation is a critical one.

* * *

The presentation of this "reader's digest" of the report of the Committee on Engineering Education after the War has been a difficult task of selection and condensation. The writer is very conscious of the limitations and imperfections of the result. He can merely repeat, therefore, a recommendation of the report, namely, that the Committee hopes that today's session will be one of the many devoted to discussion and criticism of its recommendations. A committe can do no more than state principles, analyze situations, and present conclusions and recommendations. It remains for the

great body of those interested to apply these recommendations to the further promotion of engineering education.

Scientific-Technologic Stem

H. S. Rogers (Polytechnic Institute of Brooklyn): Your Committee on Engineering Education After the War was directed to study the longer range problems of education and practice as well as the urgent problems of immediate operation, and to review the 1940 report of aims and scope of the engineering curricula as a guide to the long range objectives, programs and procedures.

The 1940 report outline separate and distinctive objectives of the humanistic-social and scientific-technological divisions of engineering education in a fundamental and comprehensive manner. The Committee was in full accord in their judgment with the basic objectives stated in that report. It thought, however, that engineering education still has much to do in the development of the programs, procedures and means for achieving these broad objectives. For that reason it decided to study further and to express its views upon certain means which seem possible in the light of present experience in engineering education.

It is my assignment this morning to discuss that section of the report dealing with the scientific-technological division, to emphasize some of the more significant points, and to elaborate some of them by further comment. I call your attention to these objectives by paraphrasing them briefly as follows:

1. Mastery of the fundamental scientific principles and a command of basic knowledge underlying the branch of engineering which the student is pursuing.

2. Thorough understanding of the engineering method and elementary competence in its application, which requires a certain knowledge of methods and ability to apply.

3. Ability to select the significant results of an engineering study and to present them clearly and concisely by verbal and graphic means.

4. Stimulation of a continuing interest in further professional development.

The objectives may be readily divided into two principal categories, one dealing with the knowledge to be acquired, and the other dealing with the abilities to be developed. These two things are not supplementary or separate, but they are complementary and just as much a part of the engineering methods as subject matter is a part of thought.

The knowledge which is required in the engineering program is, however, more often thought of in terms of mathematics, chemistry, physics, thermo-dynamic structures, and so on. These being the integral units of the curricula. As such, they are the appropriate units of the outline of an engineering educational program. Through these various subject matter fields there runs, however, a common form of engineering knowledge, and of engineering principles, which are utilized in the engineering method of thought.

The Committee has defined in this five categories, this engineering knowledge as set forth in the report:

1. The generic principles, such as the law of conservation of energy, the law of equilibrium, dynamics, which form the bases for the approach to engineering problems.

2. Certain basic assumptions, such

as "plane sections before bending remain plane after bending," which is an assumption made for the purpose of simplifying the mathematical analysis of physical phenomena.

3. Certain empiricisms, such as the properties of materials, the strength of steel, the resistance of cooper wire.

4. Certain derived and working principles which have originated from the progress and development of technology throughout the years of engineering thought, and are the heritage of our engineering profession.

5. Certain specifications and standards which have been outlined by the profession of various division leaders for the purpose of meeting standard situations in production and instruction.

These tools are utilized in the logical process of engineering thought, whether the thought is in civil engineering, mechanical engineering, electrical engineering, or in another field. Understanding of them rests, however, upon a comprehension of the physical concepts that are basic to their explanation. Knowledge is facilitated by the method of instruction, and the manner of presentation become a matter of great importance.

Generic principles and basic assumptions are best presented in connection with physical situations. Many instructors use models to facilitate the development of concepts underlying such principles.

Empiricisms are best presented in the laboratory, where phenomena can be observed and mentioned. Derived specifications and principles which have evolved in the development of technology and in the arts of engineering practice are best presented, of course, in the applied or design periods.

Facility in the application, however, of these classes of principles, is based upon a constant recognition of their nature. This is a matter of significance for emphasis throughout the entire curricula.

Knowledge of these tools in the abstract will not provide ability to apply them. Ability to apply them is very substantially conditioned by the methods of instruction in engineering analysis. Methods of instruction in engineering analysis may be expressed in following catagorical manner.

One, the analysis of a situation, segrating the parts which may be expressed in physical and quantitative terms, some known and some unknown.

Two, the expression of relationships between movement, flows, stresses, strains, and so on, in mathematical terms.

Three, the solution of the unknowns by making use of various simultaneous mathematical relationships.

Four, the determination of the desired answer by synthesis of the separate solutions.

Five, a practical checking of the answer in the light of practical judgment.

Now, such method of analysis in the thinking is characterized by discipline in the habits of work. Those disciplines emphasized in the report are industry, accuracy, thoroughness and orderliness in the use of the engineering method and the cultivation of proportionate judgment, resourcefulness and initiative.

How far we can go in the development of intuition and creative ability is dependent, in my judgment, upon the level at which such courses are taught. At the graduate level, we can do much to teach intuition and creative ability.

The Committee believes that the generalization of knowledge of engineering thought is essential to the attainment of the broad objectives of the 1940 Report. This report endeavors to set forth some of the methods by which those objectives may be obtained. There are certain courses that may stand as examples for the attainment of the objectives as related to methods.

It was my responsibility to prepare a program for the Friday afternoon meeting of the Committee on Instructional Methods, and I wanted to focus the discussion on the methods of engineering analysis in their simple and basic form, as well as the methods of engineering analysis in their more comprehensive and intricate application.

I talked to a dozen or fifteen people, asking for suggestions of men who might give papers upon such subjects, whose minds had been running along that line. I got a dozen or fifteen suggestions, and as I looked them over I was surprised to find that they were all men who had come from two different places, one from the designing courses at General Electric, and the other from the Hardy Cross-Westergaard structural courses of the University of Illinois.

I presume my questions were directed towards people who were most closely associated with work in those two different places, but it was significant, I thought, that practically any of the men coming from those two schools could discuss engineering analysis in the abstract as a method.

It might be said that these schools are conducted on the graduate level, but there are other courses at all levels in which emphasis is placed upon the methods of engineering thought rather than upon instructional matter, which can be found throughout the country. There is a freshman engineering course at the University of Washington in which some very remarkable work has been done for years. There is another at the University of Iowa, in the sophomore year, I believe. There are courses in engineering analysis in Carnegie Institute at both the undergraduate level and the graduate level. All of these courses are phenomenally successful in their results, in the disciplining of students, in the methods of engineering analysis.

I think the question might frankly be asked, Should engineering analysis be presented as such in separate courses, at various levels, or should it be incorporated in all courses? Personally, I am inclined to feel that there is perhaps a place for an introductory course to emphasize the method, and perhaps a graduate course. But certainly if we are to achieve the results which we aspire to achieve, we must place strong emphasis upon method throughout all of our engineering courses.

I don't know that the Committee is in complete accord with regard to that, gentlemen. That is my own opinion. However, the Committee does hope that the report will stimulate discussion and experimentation in engineering education, and will bring results that will enhance engineering education and improve the quality of our product.

Humanistic-Social Stem

W. E. Wickenden (Case School of Applied Science): My contribution this morning will be the commentary part of the report, rather than restatement or extension of the positions taken.

Engineers are modest men whose sense of the unattained inhibits any tendency to boasting. It will therefore do no harm to remind ourselves in a time when other areas of education are in confusion that engineering education stands out as a conspicuous success. Success in the engineer's code is not a reserved space on a flowery bed of ease; it is a spur to further achievement. You have to live up to it. Others view us as the exemplar, par excellence, of the integrated as distinct from the sequential type of professional discipline, a pattern which bids fair to have many imitators in the postwar world.

A decade ago many educators thought that the sequestering of professional training at the graduate level had been settled for all time. Now they are not so sure of it. Even doctors and lawyers are questioning whether they may not have gone too far in dissociating general from technical studies and in imposing time demands which prompted Stephen Leacock's ironic observation that "education is eating up life." And then there is the irrepressible Mr. Hutchins, who for all his supercilious mien and iconoclastic zeal is a smart boy with a lot on the ball. He sees himself as the savior of liberal education and not as the destroyer of its temples. He sees liberal education being squeezed into extinction between the stretch-out in the secondary school and the insatiable time demands of the graduate professional school. He proposes to save it by saving time that is by squeezing what he calls "the water, waste and frivolity" out of the end of the high school and the beginning of the college period, where we Americans now indulge our propensity for artificially prolonging adolescence.

We, too, would save liberal education and do it too by saving time, but even more by saving it from isolation. We would destroy rather than erect barriers between the humanities, the sciences and the technologies. We are convinced that life cannot be lived in any such artificial compartments. Occupation and citizenship, competence and culture, professional integrity and ethical sensitiveness, technical skill and human understanding are all strands in an inextricable warp and woof of the engineer's daily life. We are therefore not apologetic but rather outspoken, even militant in our advocacy of a unified humanistic-social and scientific-technological curriculum.

Remember, now, that we engineers are going to carry the banner. We do not justify our position if we make our humanistic-social program a collection of oddments and remainders, a bit of this and a smattering of that, demanding casual effort and superficial achievement. We do not justify our position if we relegate these responsibilities to routine teachers or men of unimpressive intellectual attainment. We do not justify it if we let teachers of humanities regard us as Philistines and excuse their efforts in our behalf as a missionary enterprise. We do not justify it if we neglect scholarly effort to interpret science and technology in their human, social and cultural values.

To be very blunt about it, it is now time to put up or shut up—to give the humanities and the social studies the time, the leadership, the manpower, the content and the financial support that will put them on a level in prestige and excellence with our scientific disciplines.

This report is premised on certain ideas. The first of these is that the time can be found. The way to find it

is to accept honestly the restriction of the undergraduate period to essential goals and do a thorough job of it, leaving specialization to the post-graduate or post-college period. Central among these goals is the attainment of elementary competence in engineering methods of analysis and solution as a substitute for a somewhat detailed, though often superficial, knowledge of accepted engineering practice.

The second premise is that student interest in the humanities can be enlisted. This, however, is a job to be worked at and not a preëxisting state to be taken for granted. The engineering student can be led to take pride in good speech and writing as in good drawing or photography. His sales resistance to history and to social and political institutions thaws readily enough if you make contemporary problems a point of departure. Let him once discover that literature, music and the fine arts are inexhaustible sources of pleasure and refreshment and not merely subjects for historical and critical dissection, and he is easily led on. Get economics out of the category of an abstract dismal science into an area of live issues and he will respond. We must be willing, however, to put our money on resourcefulness rather than arid erudition and on traits of personality which make culture and social understanding seem humanly desirable in the student eyes, as the late Willie Phelps did at Yale.

This suggests the third premise which is that competent, sympathetic and resourceful teaching personnel can be found, or if not at once available, that it can be developed. At this point it is hard not to pick a quarrel with the graduate schools over their preoccupation with the minutia of historical and critical investigation to the exclusion of interpretive scholarship. Still one seeks in vain for a satisfactory alternative to the Ph.D. discipline for the young teacher of humanities in an engineering college. Lacking it, he is in danger of becoming an Ishmaelite without standing in the scholarly world and thereby frozen for life to a minor teaching role.

I am inclined to think we should seek our instructors in humanistic areas at the pre-doctoral level, give them a thorough tryout, then provide selected men with fellowship grants for the final stage of graduate work, and insist upon their choosing dissertations that have a significant bearing on science and technology as related to human culture, history and welfare.

We arrive thus at a fourth premise, namely that the teaching of humanities to engineering students, together with the scholarly activities which can be associated with such teaching, offers a career worthy of first-class talents and of first-class rewards in salary and distinction.

I can cite no example more impressive than the Rhodes scholar Frank Aydelotte, who taught English to M.I.T. engineers with such distinction that he was chosen to head one of our most notable colleges, where again his intellectual leadership marked him as the future director of the Institute for Advanced Studies. Never was a man more free from pedantry or more spontaneous in his scholarly enthusiasms, and never, perhaps, was a scholar more happily at home among engineers.

The realm of science and technology is probably the richest unworked ore body of human and cultural values in the world of today. Here is material teeming with historical, biographical, dramatic and artistic interest. Why should it wait in vain for interpretive

genius, while teachers of humanities in engineering schools lament that their lot is barren and routine?

An obvious premise of this report is that if a coherent and interrelated sequence of humanistic studies is to be set up in the engineering curriculum and given its adequate share of time and encouragement, someone will have to do something about it. In a realm beset with vested interests, as well entrenched as those of an engineering college, such things do not happen spontaneously.

It will not suffice for presidents and deans to do it by fiat, much as the teachers of humanities may pray for some benevolent despot. Sabotage lurks around the corner whenever reform by fiat is attempted. There is a selling as well as a planning job to do. The humanities languish on too many of our campuses from lack of spokesmanship rather than from lack of intervention by the president or dean. Democracy with its dependence on legislative processes is slow and fumbling, but it has a better chance than dictatorship to hold its gains.

A focal point of leadership is obviously needed if teachers of English, of German, and possibly of Russian are to make common cause with historians, economists, sociologists, psychologists and political scientists to win for the humanities the place in the sun which their scientific and technical colleagues are even now ready to accord them.

If this Society and its history mean anything, it is that leadership on the local campus can gain enormously from national solidarity. That counterpart of leadership on our several campuses is to be supplied by the newly created Division of Humanistic Social Studies in the Society, in which the members of our committee have joined as petitioning sponsors.

What each of us has been saying—Hammond, Rogers and I—is that tomorrow's engineering education is going to be good general education—perhaps the best available in postwar America. It is going to be good humanistic education, as well as good scientific education, and as well as good technical scientific education. Adding the sciences and the humanities together, the typical student engineer is going to get at least two and one-half years of work that he can trade off at par in any liberal arts colleges in the land; what's more, he is going to work harder at it and with more effective motivation than his friends across the liberal arts fence.

There are solid, even compelling reasons for this effort to give the young engineer the soundest possible general education, yet to do it within the framework of the engineering curriculum. For one thing, he is to be not only an engineer but a citizen, sharing equally with all other educated men the responsibility for national security, civic welfare, cultural advancement and organized community life. The sooner we in America rid ourselves of the idea that these are the special responsibilities of any elite group, to be trained in colleges isolated from the working concerns of life, the better.

Then too, the engineering graduate is not only a scientific technician, but a prospective executive. Fifteen years after graduation three out of four will be principally engaged in directing the work of other men. Whether as expert technicians or as executives, engineering graduates will be working under a professional code which imposes not only an ethical standard of personal integrity, but also a social

trusteeship which can be fulfilled only as engineers perceive the social consequences which lie beyond the immediate outcomes of their work. To an increasing degree engineers must hold their own in teamwork with men trained in the social sciences, that is with economists, sociologists, psychologists and political administrators. This can come only through the command of a common language and a common standard of values. Creating this mutual entente is a reciprocal responsibility for which an engineering college is an ideal culture medium.

Let us return now to our original premise that in an age of social confusion engineering education stands out as a conspicuous success and must bear the responsibilities of a corresponding leadership. When, if ever, has opportunity beckoned more insistently to any profession or to any division of education to widen its influence? The profession will find it hard to rise above its educational source and there is no magic through which education can rise above its teachers. We engineers are today a divided body, vaguely groping for our place in the sun and only half aware of our social responsibilities. Other men are waking up to them. Let me read a few lines from an advertising pamphlet which recently came to my desk.

> Statisticians tell us that there are one and a half billions of people on the earth today. In the continental United States there are 130 millions or less than 10 per cent of the total. Yet among all these people on earth today 300,000 men or only two out of each 10,000 hold the destiny of mankind in the hollows of their hands! (And 60 per cent of this small group are citizens of the United States of America!)

Going on in further tribute to our engineers, we read:

> Engineering progress recognizes no boundaries, no nationalities, no limitations that can endure. Only horizons exist for engineers. As long as there are engineers in America, America will be free; and no one selfish interest or group can ever despoil Americans of their freedom, and no one, if they could, would dare.

There sounds the voice of destiny we are not going to be allowed to forget. More detailed technical knowledge will not win for the engineer this larger place in the sun. Men ask of us not only that engineers shall be expert in the particular techniques and economies of materials and energy, of products and services, but also that they guarantee to society the fruits of scientific progress and technological advance in a rising standard of well-being, worldwide in its reach.

We have learned at tragic cost that peace is indivisible, that America cannot be an island of security in an ocean of strife. Prosperity is likewise in large measure indivisible, and we cannot hope to remain long an island of plenty in an ocean of want and woe.

The engineer's battlefront is not solely in the laboratory and plant, it is in the realm of public policy, of public and industrial administration, of international economies, and of diplomacy as well. Let success breed no seductive complacency among us.

This, gentlemen, is the time to mark up our goals!

Discussion

Robert F. Legget, University of Toronto: As I have read and reread this notable Report in the last few days, many thoughts have crossed my

mind but two were persistent. First was a feeling of something more than appreciation for such a stimulating and prophetic document, which can well serve as a guide to us all in the trying days ahead. And coupled with this was a feeling of gratitude to the twenty-one leaders in engineering education who have given of their time and energy, so fruitfully, in preparing the Report.

Others have expressed this feeling of obligation, and many more will do so, more fittingly than I. There is, however, one factor which leads me to voice my feelings now and that is, Mr. President, that when you appointed the Committee to prepare this Report, you included in its number a Canadian. There are about ten of us here, foreigners in your midst and yet of course quite indistinguishable, and I know that I speak for all when I say that your action in thus recognizing Canada was very widely appreciated. I say this alike because of the tribute thus shown to Dean C. R. Young, for whom we all have such respect, as also for the evidence which your action gives as to the insignificance of that political boundary when it comes to the things that matter.

If I may proceed to utilize my five minutes to the full, I would like to ask two questions and then to make one general comment. On page 596 this statement appears: "Obviously, engineers will not assume the more conspicuous critical and creative roles except in relatively few cases." In view of the awakening public interest amongst so many members of our profession, and of the corresponding interest now shown by the public in our profession, the use of the word "Obviously" is not clear to some of us and the positive use of "will not" prejudges an issue in a rather disturbing way. Did the Committe, I wonder, really mean to predicate so specifically on this point? Then on page 610 it is suggested that separate classes for returned veterans may be advisable in order to segregate them from other students. I was an undergraduate just after the end of the last war and so studied with veterans of that war. I can testify to the profound effect which that experience had upon my work and outlook—it seemed then, and does still today, to be a very special privilege thus to associate with men who had been through the hell of war and yet were but little older than ourselves. I therefore wonder if the Committee took into consideration this aspect of what is, admittedly, a many-sided question, and studied the general experience of the graduating classes of the early twenties?

The fact that after several readings of the Report I have these two questions only to ask is, perhaps, the best tribute I can pay to the Report. There may be some who say that the Report deals only with the obvious. Need I remind such an audience as this of what President Coolidge once said about the obvious? How when criticized for talking too much about the obvious, he said that one day he was going to write an article on *The Importance of the Obvious* since if all the people in the United States (may I say rather, in North America) would do the few simple things they knew they ought to do, most of our big problems would take care of themselves. Others may think, and may even say, that the Report is too idealistic. It does suggest ideals but can we not usefully remember that ideals are like the stars: "We shall never be able to touch them with our hands but like seafar-

ing men upon the desert of waters, we may choose them—if we will—for our guides and, following them, may approach eventually to our destiny."

It is because of the ideals implicit in this Report that I venture, with some diffidence, to make one small request. I do so with the assurance that I speak not for myself alone. The Report deals with the training of engineers but throughout, like a golden thread, is the concept that to train good engineers is not enough; we must train good men. Good engineers assuredly, but may we not forget that the very glory and perfection of our inventions and of engineering achievement may lead us to be blind to the fact that they are, after all, a means and not an end in themselves? Science, it is suggested, has no values; of engineering the same might well be said. This is suggested in the Report. I once heard it said in an address which I hope all of you know, that entitled "A Century of Inventions" by Sir James Alfred Ewing, delivered at the postponed centenary of the Institution of Civil Engineers in 1928. The white haired scientist and engineer brought his most moving address to an end with these words: "I used, as a young teacher, to think that the splendid march of discovery and invention, with its penetration into the secrets of Nature, its consciousness of power, its absorbing mental interest, its unlimited possibilities of benefits, was in fact accomplishing some betterment in the character of men. I thought that the assiduous study of engineering could not fail to soften his primitive instincts; that it must develop a sense of law and order and righteousness. But the war came, and I realized the moral failure of applied mechanics. . . . I saw that the wealth of products and ideas with which the engineer had enriched mankind might be prostituted to ignoble use. . . . The arts of the engineer had indeed been effectively learnt, but they had not changed man's soul. . . . Does it not follow that the duty of leadership is to educate his judgment and his conscience? . . . Surely it is for the engineer as much as any man to pray for a spiritual awakening, to strive after such a growth of sanity as will prevent the gross misuse of his good gifts. For it is the engineer who, in the course of his labors to promote the comfort and convenience of man, has put into man's unchecked and careless hand a monstrous potentiality of ruin."

The authors of this outstanding Report which we are now considering had similar ideas in mind; they constitute the golden thread to which I have referred. So it is that each time I have come to the end of the Report and read the concluding words—the suggestion that "educational problems should be considered on broad lines in the interest not only of industry and the engineering profession but of the nation as a whole"—I have found myself wishing that the authors had gone one step further and put into words that which is implicit in what they wrote regarding the high calling which is ours, thus synthesizing the basic conclusions of the two parts of their Report.

May I therefore presume to suggest that before the Report is broadcast throughout the land and finally placed in our records, a few more words might be added—words which will suggest that the young men we are to train should be helped to lift their eyes beyond the confines of one country, even of a very great country, looking rather towards the welfare of the com-

munity of nations as a whole; words which will help us to beware of the insidious attraction of current catchphrases in matters both economic and social, and to rely rather on the things which are true and of good report; words which will show that engineering educators do have a fine sense of values and one which is truly militant; words which may therefore help us to do our small share in trying to ensure that the works of our students shall not again be prostituted to ignoble use.

Paul T. Norton, Jr., Virginia Polytechnic Institute: In the last paragraph of Part I, the Committee expresses the hope that "one of the chief results of this report will be the stimulation of educational experimentation among engineering colleges and the presentation of papers before regional and national meetings of this Society on specific measures for accomplishing the purposes indicated herein." In this discussion I shall attempt merely to indicate what seems to me to be one of the most promising fields for such experimentation.

During the past year or so I have read carefully many papers by eminent engineering teachers, and have been disappointed at the almost complete absence of suggestions that engineering curricula should contain any specific preparation for the management and operation of industry. The present report does refer briefly to this matter, but, while in agreement with what the Committee has to say about this subject, I do not feel that the report devotes nearly as much space to it as its importance warrants.

In view of the great importance of the subject it seems odd that so little attention has been directed to the many references to engineers in management which one may find in the two volumes of the "Report of the Investigation of Engineering Education, '1923-29." For example, Dr. Wickenden in his final report discusses this matter at some length on pages 1059–1070. After pointing out that the great majority of young engineers begin their careers in technical work but that in a comparatively few years three out of five are engaged in administrative duties, Dr. Wickenden continues by saying on page 1061 that "if success hinges on economies in production, on creating and maintaining an intricate plant, on keeping a complex service in operation against physical odds, or if the constant risk to be faced is that the whole enterprise may be superseded by some new invention or research product, the engineer is likely to have the call." Again on page 1065, he says that "the recent advances in tools, processes and materials, where Americans have led the world, have come from the industries, with almost no help from college laboratories." Also on the same page that "critical studies in the physical and economical limitations of tools, and researches in the basic phenomena of shop processes have been rare, almost non-existent in America, but actively pursued in the technical universities of central Europe. . . . We endeavor to teach the art, but neglect research, while European teaching of production technology is a direct outgrowth of research."

During a very large portion of the last thirty-eight years I have had some connection with the production problems of the mining and manufacturing industries, but I never fully realized the significance of these statements by Dr. Wickenden until last year when I was Chief of the Industrial Process Branch of the Office of Production Re-

search and Development of the War Production Board. We found that in spite of the great productivity of American manufacturing industries production research and development was not nearly as well organized as one would have expected. In the southern California aircraft industry this activity has been organized on an industry-wide basis through the Aircraft War Production Council. This very significant development is only one of the many activities of the Aircraft War Production Council which merit close study by members of this Society.

Our political and business leaders agree that if we are to have real and lasting prosperity after the war we simply must find ways to produce goods and services more economically. Mention will be made of only two of the many problems in this general field which seem to me to be as truly engineering as any problems one could possibly find in design or technical research. These particular illustrations are used principally because I have been directly connected with developments in these fields.

Some twenty years ago Dr. Shewhart, of the Bell system, introduced what is often called the Shewhart method of statistical control of quality. Industrial management in general was very skeptical and there were certainly not enough qualified persons to introduce these ideas generally even if management had been convinced of their desirability. In 1942 two E.S.M.W.T. courses in this field were sponsored by Stanford University, one on the Stanford campus and the other in Los Angeles. It was only because of the heroic efforts of Professor E. L. Grant of Stanford that qualified students were secured for these first two courses.

Almost the first suggestion that was made to me when I reached Washington early in 1943 was that the War Production Board should sponsor work in statistical quality control. We undertook this program and I believe that it has been the most successful of all of the projects which were begun while I was Chief of the Industrial Processes Branch. Courses like those first sponsored by Stanford in 1942 have been given in most parts of the country and companies which a year ago were very skeptical are now asking for more service along these lines than can possibly be given. One large manufacturing company believes that its savings due to the use of statistical quality control methods amount to at least ten million dollars a year.

Even among industrial managers there is no general realization that with our present large investments in plant and equipment and with our high corportation tax rates it is perfectly possible for corporation taxes on apparent profits to amount to more than the real profits. This unfortunate condition can easily result from an error in setting depreciation rates. Depreciation and statistical quality control are very different problems but they are alike in at least two respects. First, they are certainly engineering problems, and second, very little attention has been devoted until quite recently to either problem by the engineers of the manufacturing industries. In many respects depreciation is much the more difficult problem of the two, because even if the engineer solves his part of the problem, he must work closely with the financial and accounting people if the entire problem is to be solved correctly. One of the largest manufacturing companies in this country has recently appointed one of their engineers to the position of assistant comptroller, some-

thing we have for years been predicting would happen just as soon as management realized that most problems in the general field of engineering economy, including depreciation, are fundamentally based on physical assets and not on bookkeeping figures.

Statistical quality control and depreciation are only two of the many problems in the solution of which the engineer should take a very active part. It is to be hoped that the engineering colleges will take advantage of their opportunities to introduce these ideas to all engineering students. Some engineering teachers may feel that the very fact that such a large percentage of engineering graduates have in the past become industrial managers proves that the conventional sort of engineering curriculum is satisfactory preparation for all sorts of engineering, including industrial management. Such persons might well consider that graduates of colleges of business administration have only in quite recent years been in competition with engineering graduates in the fields which we generally lump together under the term industrial management.

The inclusion of a very few management courses in all engineering curricula, would, I believe, be helpful in at least three specific ways. At least some of this material, when properly taught, can be made a most excellent part of the humanistic-social stem. These courses introduce the student to the art of engineering. There would probably be a stronger professional consciousness among engineers in management positions.

It should be understood that in this entire discussion reference is made to engineering curricula as a whole and not to industrial engineering or similar curricular. All engineering students should be introduced to management ideas during their undergraduate years; this can easily be done without interfering in any way with the engineering fundamentals or a reasonable amount of technical specialization. I suggest that either an entirely new committee or a sub-committee of the present committee be instructed to study the specific problem of management in engineering education after the war. This committee or sub-committee should represent the Society as a whole and not the Industrial Engineering Division of the Society, but it should include several persons who have a professional interest in the various fields of industrial management.

Harold E. Wessman, New York University: Much as I find myself responding to and in accord with the objectives of this report, I fear with respect to the humanistic-social stem, that we are in the position of an engineer who has prepared a beautiful set of plans and specifications and then finds that there are no qualified contractors who will submit a bid. I refer to the teachers we need in order to accomplish our objectives. We either cannot find or cannot get the type of teacher required. I say that with full recognition of the fact that in several institutions, such as Carnegie Institute of Technology, one will find an excellent staff carrying out an integrated program in humanities and social studies. But until the teacher training program suggested by Dr. Wickenden in his talk this morning has fully matured, and independent recognition is assured for liberal arts teachers on engineering college staffs, I believe that we can accomplish more on those campuses where colleges of liberal arts exist side by side with colleges of en-

gineering, if we can arrange with the administration of the liberal arts college to admit our students to the classes of those inspired and inspiring teachers who now occupy the chairs of history and political science and literature. It will be necessary in many instances to break down the bars of established prerequisites; there are other difficulties that exist. These are matters, however, which I believe can be ironed out by effective coöperation.

If my students can sit on the doorstep of a great man like Garner in Political Science at the University of Illinois, or a Billy Phelps in Literature at Yale, I am not much concerned whether the course they are listening to is integrated into a fixed pattern of humanities set up in the curriculum of a college of engineering.

Wilbert J. Huff, University of Maryland: I was much impressed with this report, and offer anything that may appear to be criticism with considerable humility in the presence of the sponsoring committee, whose qualifications all of you know. Nevertheless, I feel that I should bring forward a word of dissent, or more properly remark upon an omission.

As an enthusiastic teacher of engineering, I do not want my students to lose sight of the fact that engineering excellence lies primarily in engineering. Recognition is accorded engineering for the meritorious creative achievements, and our primary task is to inspire our students to maintain this. I would be dismayed to leave this meeting feeling that it had endorsed any other attitude.

Admittedly, in human relationships, our students at times do not do what we would like. Admittedly, many of them have not risen to the heights we think they should attain. Will the mere assignment of courses in the humanistic-social field overcome the handicap?

I recall some years ago, at a meeting of a university governing board, some remark was made about the poor spelling, the poor English, and the poor presentation of some of the brilliant students, evident even after graduate work. The university President, from his years of judgment, wide contact and much humanistic-social knowledge said, in effect: "Well, there are some people who cannot be expected to use properly the English language, or to spell properly, no matter how much you reach or teach in the classroom. They are not literary; they have never known from their family background and their associations the literary viewpoint."

What is the reason for the failure to progress in human relations? The reason is that many of our students, after they leave the classrooms, have no social and humanistic contacts of the types required for leadership. Our omission is that we have paid little or no attention to the developmental phases of student life after the classroom, even in universities and colleges having the dormitory system. This omission is an indictment against the American system of higher education broadly.

When we consider the situation that confronts the urban engineering institution, drawing students from families that sacrifice to afford the students an engineering education, often under difficult circumstances, and remember that these students may spend hours coming to school and returning home each day, and that they study under difficulty, it is clear that many students

have little or no opportunity to practice humanistic-social precepts.

Personally, I do not want to remove the emphasis on the technologic and scientific studies in the classroom that must comprise the engineering equipment of our students if they are to maintain their contributions in this complex world where industry and daily life require more and more knowledge of science and engineering. I do believe, however, that it is our responsibility to exert our influence to give the worthy student an opportunity to practice humanistic-social relationships under desirable auspices. Admittedly, in most cases, students cannot attend schools of the liberal arts. What is to prevent the development of a student social system that will permit engineering students to associate with others who are devoted to such work? We cannot expect a man to be a gentleman in the finer sense, and to be adept in all the practices of polite society if he does not have opportunities to associate with and practice such arts.

If we recognize and correct this omission, I think a great deal can be done for our students without necessitating the giving up of the primary emphasis that has made engineering great.

A. R. Stevenson, Jr., General Electric Co.: During this war period when industry is taking on so many very complicated tasks, very young men out of college have had opportunities that have never occurred before, taking on responsibilities that ordinarily men twenty years out of college might not have had. I think almost everyone can testify that these very young engineers have done a superb job. It is just unbelievable the way they have done these things and what they have accomplished.

Therefore, we can say that engineering education has been very good in the past, but we musn't be too complacement. There are new things that can be done. I think Professor Norton is correct that most engineers fifteen years out of college are more interested in social things than in purely technical affairs. They handle those responsibilities well. They have learned to do it, perhaps, in extra-curricular activities. They could perhaps learn more intelligently about human relations if there were more in the curricula to guide their interest in that direction.

I have quoted Professor Spaeth of Princeton several times, and I like the story so much that I want to quote him again. He pointed out that there is one law for man and another law for things. To illustrate, it would be ridiculous for an engineer to make a bridge and say, "Now dear bridge, for my sake stand firm when the floods come." Bridges are things and do not respond to emotional appeals. Then he goes on to show that it is just as ridiculous to believe that people will respond to the hard cold logic which controls the action of things.

Now in the curricular part of engineering education, we have dealt almost entirely with things which respond to cold logic, and it is a little shock for the young engineer to wake up to the fact when dealing with people that it isn't sufficient to be right, one must persuade.

I notice the previous speaker spoke of the distinction between logic and emotion, and mentioned that the humanistic stem has to do with emotion. We do want to awaken our engineering graduates to the importance of

those emotional aspects. On the other hand, I think the humanistic professors will have to come half way to meet the engineering students in order to get their interest. A great many humanistic professors have never studied engineering, and have very little knowledge of mathematics or physics. They do not know enough about the hard cold logic of things to talk the same language with the engineering students. If they could educate themselves by perhaps taking some of the engineering courses so that they could talk the same language as the students they could lead the student along. If the professor of English can get the confidence and enthusiastic support of the students then he can lead them over into the more cultural part of the subject which is necessary in order to give clarity, conciseness and elegance to anything which is written. I think that by leading in that way they can accomplish what they want; but they can't stand on the other side of the river and call to the student to come across and hope that he will come with enthusiasm.

In any engineering project there are at least three things that have to be done: You have to have the judgment to select a problem that is worthy; you have to be able to solve the problem, and you have to sell the solution. Colleges have largely concentrated—and perhaps it is industry's fault for asking them to do so—on the central one of solving the problem. We would like broadly educated men that can pick problems that are worth doing, that can solve the problem and that can sell the solution.

K. O. Thompson, Case School of Applied Science: Teachers of English, I think, should feel great appreciation for the recognition which this report as a whole gives to the field of the humanistic studies. Too long we have felt that we were insignificant in the eyes of administrators and college officials generally.

Welcoming the recognition conveyed in this report, I would like to voice a plea that the men who teach in the engineering departments realize the significance of it and carry out the aims and purposes as presented in this report by campus coöperation toward the subjects in the field of language and literature or the humanistic-social stem. I think a good deal of work may be necessary to win for us all that degree of cordial coöperation that we in the humanistic-social branch would desire.

In think most of us have been a little scared of the words, "integration," "coordination," perhaps even of "coöperation." We have felt that perhaps integration meant absorption, and that our task would be simply that we should correct the reports and essays of the engineering departments. That, I think, is certainly not the intention of the framers of the report, and I continue the plea that the men in the engineering departments give the ideals of integration a little different meaning from that.

There is another difficulty it seems to me in this idea of integration or coordination, within the subdivisions of this stem itself. That is, are we who teach English, especially in its literary phase, to use material in the field of economics, history, and sociology, or is there some distinct place for literature as such? Most of us, of course, have been trained in liberal arts colleges; we are not engineers. We have come into the engineering atmosphere rather late in life. The very nature of

our subject to a large extent, at least in the field of literature, is one that stresses the personal, imaginative, emotional, idealistic side of learning. The idea of this recognition, it seems to me, must not lose that sort of a spirit or attitude or background by any process of absorption or integration in the now limited sense of that term.

Perhaps the phrase "humanistic-social" is not altogether to our liking either, but we have no suggestion as an alternative, and we have to admit that any pair of words is intended to be complementary, like the scientific-technological on the one hand and the humanistic-social on the other, perhaps paralleled by the words professional and liberal, although there are objections to any pair of words.

We want to feel that language and literature are going to maintain a distinct place in this new recognition without being lost sight of by any mere mechanical narrow interpretation of the words "integration" or "coördination."

I am sure that I voice the feeling of my fellow teachers in the field of language and literature that we are profoundly grateful for the splendid presentation on the part of the presidents and deans and others for the adoption or the attainment of things that have been our aims and hopes and ideals for many years past.

The Coming Priority for Engineering*

By F. V. GEIER

President, The Cincinnati Milling Machine Co.

I don't know whether I can express to you ladies and gentlemen what an extraordinary experience it is for me to be standing here facing all these educators. I grew up through school and college, and to me a professor has always been equal to, or more than, a match for any number of students up to 500 or more. Tonight I, a single layman, am supposed to be equal to 600 educators, and of course that is a mathematical absurdity. Nevertheless, here I am, a clear answer to whoever may have asked, "Why does a business man never take a risk nowadays?"

The finest talks I have ever heard in my life, I think, without exception, have all been given by educators. I have always marveled at their gift of expression, the logic and the fine flavor of what they had to say. They point out the objectives, and then they lead you with geometrical directness from each major point to the final conclusion.

I realize that as a speaker before you tonight that is the kind of a talk I ought to give, without notes, and with that clearness, conciseness and directness to which you are all accustomed. But instead, all I can offer you is a ramble through the woods, and the meadows, hoping that on the way you will see some glimpses of things which later on you can synthesize into something worth remembering.

The thing I remember most about my life in college is the remark that was made in almost every class by one or our economics professors. Usually when we gave an answer that we thought was quite good he would say, "Important, if true." So we were very anxious in class, and I have a feeling like that tonight. Only before a group such as this, I am not worried that you might have that thought, but rather that you might say, "Unimportant, even if true."

Now I warn you, I have been asked to speak at length. I am sure you remember Mark Twain's story of his experience in the church as he listened to a sermon. He was deeply moved by the sermon and after the preacher had been talking about fifteen minutes he made up his mind he would put a dollar into the plate. But the preacher continued, and Mark Twain began to revise his idea about his contribution, until finally when the plate came to him he reached in and took out two bits. It is an axiom that it is almost fatal to talk more than twenty minutes. Usually among the people with whom I work it is very wise to find a way to tell your story in three or four minutes at the most. And yet, I have been told tonight that I must go on at length, so I can only conclude that you are made of sterner stuff. That is perhaps as it should be, because after all, it is yours to train a new race of men.

*Presented at the 52nd annual meeting, S.P.E.E., Cincinnati, Ohio, June 22–25, 1944.

When we contemplate the Divine plan of the universe, and our own planet, we can only say, "What a plan!" Certainly the mind of men can conceive of nothing more limitless, nothing more fascinating, as a field for the scientist and the engineer. What a challenge! What an inspiration! What a job of work for the engineer!

In the beginning, man's elemental need for food, for shelter, and for self-preservation soon led to the use of tools and weapons. With intelligence and thought applied to these activities came the beginning of engineering. And so on down through the ages the engineer has been largely responsible for the tools, the weapons, and the facilities for the world's work and for the business of living.

The engineering method was applied in ever broader fields. What the engineer has done to unlock the storehouse of nature, to multiply the efforts of man, to ease his labor, and to enrich his life, is written throughout the pages of history for all to see. And today, the field of engineering is nothing less than the work of the world. That world today comprises all the land, the sea, and the air overhead. That world today has been aptly called, "One World," and its life and work has become so interrelated and so complex, that it challenges as never before the knowledge, the resourcefulness and the courage of the engineering mind.

You men of all groups, know the task awaiting the engineer in the basic sciences, in the search for new elements and new materials; in the finding of new uses for old materials and for known processes, in enlarging production yield and reducing production costs, in creating markets and adding purchasing power, in communication and transportation, in more effective industrial management, and in bringing the benefits of science more broadly into the lives of our fellowmen. Here, clearly, there is advancing priority for the engineer. The task and the future seem so clear as to be obvious—that is, obvious to all except to the advocates of the "mature" school of economics who have been insisting that America has been completed, that there are no frontiers left, and that we had better trade in the old super power American pioneer automobile for the new standardized security model that may just get us to and from work but will never really go places. Perhaps these scholarly gentlemen have access to sources of misinformation denied to some of the rest of us!

"No new frontier?" How far that is from the language of the engineer! He sees a frontier waiting to be conquered wherever he looks. Even the "mature economy" advocate should be able to see the new frontier in the stars above us and in the earth about us. For to the engineer it is all frontier, with no single spot on earth as yet enjoying all that modern engineering and science can provide. And still beyond, there are the earth itself, and the forces of the universe, as an everlasting frontier challenge to our engineers and scientists.

As an example of the tasks before the engineer, we might take the vital question of employment. Until recently employment was in the same class as the weather which, according to Mark Twain everybody talks about but nobody ever does anything. Today somebody is doing something about employment, and it is American business enterprise that is doing it.

The idea started with business, and business is right now at work in over

2,000 communities to put it into effective action. The American economy was in poor health in the 30's, our last peacetime decade. Even in 1939, the peak year of the decade, when stimulating war influences were already present, the value of industrial production was 19 per cent below the 1929 level, and 8 per cent below even the level of 20 years before. I hesitate greatly to cite statistics like this, lest many of you subconsciously classify me as a statistician, one of those men who draws a mathematically straight line from an unwarranted assumption to a foregone conclusion.

Nevertheless, the decade of the 30's saw the physical plant and equipment of the nation becoming run down at heel. Conditions were such as to arrest the normal replacement and extension of plant out of the reinvested corporate earnings, and the flow of individual savings through the usual capital markets to finance industrial plant and expansion was choked off. At the same time, depreciation, depletion, losses by fire and obsolescence were cumulating. As a result, in this decade, the nation fell short of having maintained its economic machine by upward of 50 billion dollars, without making any allowance for the growth of population. As a nation, we plainly did not earn our keep.

At the same time, the number of industrial establishments continued to decline, and the crop of new job-giving enterprises was all too small. Something was plainly wrong with the economic climate; something would have to be done to restore the invigorating atmosphere under which the nation and its economic life had grown great, to become the envy of the entire world. By this time it was clear that the devices and legislative enactments of the 30's were not creating employment, for we still had 8 million or more unemployed. There was only one practical answer: To restore to America the kind of vigorous economy that creates opportunities and productive jobs for all who should be at work producing goods and services for the nation.

At that stage a group of industrial leaders set to work. They formed a Committee for Economic Development, with Mr. Paul Hoffman as Chairman. They set out to clear up the economic atmosphere by inviting a number of leading economists to study and report on such vital questions as the following: The effect of our tax structure; the incentives and deterrents to business enterprise; monetary and banking policies; reconversion problems; disposal of government-owned plants; the postwar problems of agriculture; the removal of wartime controls; and so on. They believed that if the facts of economic life and employment are laid bare impartially and without political bias the nation will squarely face the opportunity to restore a healthy economic climate by revising whatever legislative, administrative business and labor policies now stand in the way.

But a healthy economic climate is only a means to the real objective of the Committee for Economic Development and that is a high level of employment and production. In a single word the aim of the Committee is: *Employment.* After the war we will need 9 million more jobs than we had in 1940. To make our economic books balance we will have to produce 140 billion dollars of goods and services compared to 100 billion in 1940.

As we look back we may well ask whether America in the 30's was facing the economic facts of life in a

realistic way. Today, even while the nation is pouring its whole effort into the war, we know that when victory is won we shall abruptly face the unsolved problems of the 30's, many times magnified by wartime dislocations and wartime measures of control. We face a rebuilding of a new peacetime America.

What kind of an America will that be? Can we produce a greater total of peacetime goods and services than ever before? Can we provide productive peacetime employment for more people than ever before? Can we build a greater peacetime home market for more Americans to buy and enjoy more goods than ever before?

The Committee for Economic Development and American industry say that the answer is "Yes." They have set a goal of 9 million more people at work and 40 billion dollars more national output. In over 2,000 communities the program of the C.E.D. is in action today. All over the country thousands upon thousands of firms are making plans and preparations for new products, broader markets, more production and more employment.

Who are making these plans and preparations? The business executive has said, "Let's go!" Here again he has turned to his right-hand man, the engineer; the man who by instinct and training is best fitted to make plans and preparations in advance. Right here in this concentrated attack on the employment problem is one of the most vital tasks the American engineer has ever faced. It is particularly significant that much more than half of all the increased employment must be realized in manufacture, construction, utilities, transportation and mining—all fields in which engineering predominates.

How quickly engineers themselves sensed that this was to be very much their job is evidenced by the fact that it was the Engineering Society of Cincinnati that organized the first important meeting in our city to discuss postwar employment and production at a time when this whole program was still in its formative stage. You yourselves are keenly aware of the many ways in which the engineer has contributed to this job. You fully appreciate the many problems he is being called upon to solve in what little of his time remains after meeting his heavy wartime assignments.

There is no need for me to catalog these problems, but in passing I should like to mention just two. The first of these is America's plant. We entered the war with our economic facilities more than 50 billion dollars below par. Even with the addition of all of the government-owned plants and equipment suitable for peacetime use, we are still deeply in arrears, without making any allowance for the growth of our population in the past 15 years. To bring the physical facilities of the nation up to a level reasonably modern and reasonably adequate, the engineer faces a simply stupendous task.

Then there is that most crucial problem of cost. This is airily dismissed by some on the score that the enormous wartime expansion of credit and the presure for still higher wage rates inevitably mean materially higher postwar costs and prices. All this ignores the predicament of the very great minority and perhaps even a majority of the people in the country who have had little or no wartime increase in their earnings or income. We all have in mind the situation as to fixed incomes, income from savings and endowments, as well as the many other

groups not on an industrial payroll economy. For all of these, we must have not higher but lower prices. Even the industrial worker himself, who during the war has enjoyed unprecedented wage income, has a vital stake in a postwar price level as nearly as possible on a prewar basis.

Today the average hourly wage in manufacturing industry is fully one-third higher than prewar. There is only one sure way to prevent this higher base wage from correspondingly raising selling prices and correspondingly reducing the consumer's purchasing power. That way is for engineers to devise methods and equipment which will produce enough more output for each labor hour to hold the cost per finished unit around pre-war levels. There is no surer way to a higher standard of living for all the people. There is no better way to underwrite the program for adequate employment for all. There is no greater task calling for the best the engineer has to give.

If there is any lingering doubt in your mind as to the coming priority for engineering, or the place of the engineer in rebuilding a new peacetime America, I wish you could have heard at firsthand the response of fifty industrialists with whom I recently discussed the role of the engineer. These executives were unanimous in recognizing the great and growing importance of the engineer. They were anxious to encourage him in every possible way, to help him develop his capacity and his ability to play a major part. What is more to the point, they backed up their convictions with cold cash, and in ample amount to provide a fine new home for the activities of all our engineering societies, as a public tribute to our engineers, and as a living memorial to the late Dean Herman Schneider, the great educator, scientist, engineer and friend of us all.

Here, now, is the task before the engineer: First, we must run our present economic machine better, we must run it at higher capacity and at lower cost, and we must run it without down time.

Second, we must build an improved model with still higher capacity and still lower operating cost, as nearly foolproof as possible to yield all of the new production and services, new techniques and new ways of life that science can conceive and engineering provide for the American people.

To do this job what training and what qualities does the engineer need? Much has been written on this subject, and perhaps I should have studied what has been said by more experienced and wiser men. If instead I make a few simple observations I know I run the risk with a group as distinguished and expertly informed as this, that just like Mother Hubbard opening the cupboard, you will look in to find my mental shelves decidedly bare, and you will probably say, "We have to train our students to be able to work with men like that!"

Of course, nobody can tell you how to run your business. It puts me in mind of a man who was accosted by a beggar, who asked him for a dollar. The beggar was a pretty straggly looking sight, and the man thought, "I wouldn't mind giving him a quarter, but when he asks for a dollar, I think I'll just give him a dime." But strangely enough, the beggar gave the dime back. The man couldn't understand it. He said, "Why won't you take the dime? I was going to give you a quarter, but when you asked me for the dollar I though a dime was enough." The beggar said, "I gave

you the dime back because I asked you for a dollar and I don't allow anybody to tell me how to run my business."

Here's where I will venture on dangerous ground in telling you how to train engineers. If I had anything to say about a textbook I would ask you to print in bold red letters on page one of your books of economics and of engineering, this: *The law of enlarging opportunity is the first law of economics and the first law of engineering.* That is the sum total of my contribution on how to educate an engineer.

So I am not going to attempt to tell you anything about how to train engineers, but perhaps I may be forgiven if I comment on some of the traits and some of the qualities that might well make engineers even more effective in the work in industry.

I can well imagine how anxious you all are to avoid teaching the oncoming generation subject matter in any way behind the times, and how concerned you are to place the emphasis where it should be placed. I make that assumption because we in business always have a mortal fear of not being up to date. The sword of Damocles hangs over our heads every day. From morning until night, we are constantly afraid that the thing we did yesterday isn't good enough for today, for tomorrow; that the methods, the machines, the designs, the ideas have got to be changed before somebody else changes them to our sorrow. No doubt, very much the same thought is in your mind as you seek to keep engineering education fully abreast of the latest developments all through the world.

I know that if you go out, as we say, to "call on the customers," the firms where engineers are needed, not only the larger firms who probably are well represented in this Society, but some of the medium-sized and smaller ones and those who need engineers but don't know it, you will get a warm welcome indeed. And if you want to have your textbooks and your teaching material up to the latest in industrial practice, I know you will be welcome to take a job in industry during vacation periods and sabbatical years—if they ever come back.

Living among a hundred engineers and working with them every day as a lone layman is a great pleasure. It confirms the life-long wish that I had had the benefit of an engineering education. I hear them talk about their problems, about what might help to solve those problems more rapidly and more effectively, about their needs, their plans, their hopes for the engineers they work with. May I mention some of these.

For one thing, there never seem to be enough good men. There are never enough men who can do things. The greatest need of all is for men who know the right thing to do and know how to do it.

Then there is the need for that vital quality—the ability to get other people to do things. And then, men with ideas; there are never enough new ideas. There never is enough resourcefulness to cope with the problems from morning till night. Progress seems to go at a snail's pace. All too often it seems that things have to be done the same way they were done before. We all know there must be a better way if we can only find it. So the great need is for men with more new ideas, and more resourcefulness.

And then there is the question of attitude. Attitude is important because you can't get things done without it. Attitude seems so important to us that in our own training school

which starts with college and engineering school graduates, but mostly with high school graduates, we have finally come to put attitude at the top of the list, because it seems to be the thing that is most helpful to the man's future progress with himself and with others.

Curiously enough, after we had been emphasizing attitude with these younger men in training over a period of time, there was a greater demand among our executives for these boys who came out of that training school than there was even for the boys with university and other types of higher education; that these boys, with basically less educational, intellectual and background advantages, were nevertheless easier to work with, more adaptable and ready to go and do things. Attitude is one of those tremendously important things that you can develop in your students in the years in which you are molding their character.

One weakness sometimes found among engineers is the difficulty of getting on with other people. All of us get wrapped up in our own ideas of how something should be done. No matter how good an idea we may have it is worth little if we are incapable of conveying it to others so that they will accept it and act upon it.

Another point is technical proficiency. That seems a strange thing to mention. Perhaps engineering education today, broadly rounded as it is, may be more suitable for the man who enters the medium-sized or small company where there are very few engineers. But in the larger firms today the competitive struggle is so keen that proficiency, and thoroughness in specialized fields is absolutely essential. There is a real need for more men who are real experts in certain fields.

Another requirement of growing importance is appreciation of the cost factors involved in business problems. By that I don't mean cost accounting. I mean a sense of values, of the cost tangibles and intangibles that are involved in the problems. These cannot always be stated in a mathematical way, but they are the factors that largely determine over a period of time whether decisions are going to be more than half right or more than half wrong.

Then, strangely enough, a number of men tell me, "We wish our engineers had had more English. We wish they could express themselves more concisely, more clearly, both in a written way and in a spoken way before groups."

Time is too short nowadays for ambiguity, delays or mistakes. The problem is how to do a job speedily without mistakes; how to get other people to understand and how to produce with the minimum of lost motion and wasted effort. Clear, concise expression, and the ability to make others comprehend your design, method or program, is fundamental for the engineer's success.

Most important of all, let me emphasize that all of the qualities essential in management and administration are what we hope to find increasingly in men with basic engineering training. The engineer has his place in the laboratory, in the factory, in selling, but he must also move into management. We don't employ engineers as engineers. We are looking for men who will be management, who will run our company, who, because of their engineering training, will do the job better than those who are carrying on today without the benefit of that engineering background.

Everywhere we see the increasing responsibility and the enlarging taste of the engineer. The work to be done, the opportunity for progress is greater than we have ever known before. The coming priority for engineering is clear.

May I remind you of several paragraphs written by Robert Southey, and printed in the *Edinburgh Review*, January, 1830. He said: "The present moment is one of great distress. But how small will that distress appear when we think over the history of the last forty years—a war, compared with which all other wars sink into insignificance—taxation, such as the most heavily taxed people of former times could not have conceived—a debt larger than all the public debts that ever existed in the world added together. Now and then there has been a stoppage, now and then a short retrogression; but as to the general tendency there can be no doubt.

"If we were to prophesy that in the year 1930 a population of 50 million, better fed, clad and lodged than the English of our time, will cover these islands; that cultivation, rich as that of a flower garden, will be carried up to the very tops of Ben Nevis and Helvellyn; that machines constructed on principles yet undiscovered, will be in every house; that there will be no highways, but railroads; no traveling, but by steam; that our debt, vast as it seems to us, will appear to our great grandchildren a trifling encumbrance which might easily be paid off in a year or two, many people would think us insane."

Continuing, he observes, "Hence it is, that though, in every age, everybody knows that up to his own time progressive improvement has been taking place, nobody seems to reckon on any improvement during the next generation. We cannot absolutely prove that those are in error who tell us that society has reached the turning point, that we have seen our best days. But so said all who came before us, and with just as much apparent reason.

"It is not by the inter-meddling of the omniscient and omnipotent state, but by the prudence and energy of the people, that England has hitherto been carried forward in civilization; and it is to the same prudence and the same energy that we now look with comfort and good hope.

"Our rulers will best promote the improvement of the people by strictly confining themselves to their own legitimate duties; by leaving capital to find its most lucrative course, commodities, their fair price, industry and intelligence their actual reward, idleness and folly their natural punishment, by maintaining peace, by defending property, by diminishing the price of law, and by observing strict economy in every department of the state.

"Let the government do this. The people" and, I might add, the engineers "will assuredly do the rest."

And we can well ask, was this great progress brought about by legislative enactment, or was it created by practical-minded men, by the engineer who sought for the meaning of things, and who had the vision, the courage and the ability to do things? Today we all know that it was the engineering-minded man inheriting a place of leadership that was rightly his.

So it must be in ever greater measures from here on. That high quality of engineering leadership for the future is in your hands. Yours, gentlemen, is the solemn responsibility, and the supreme privilege to provide those men for a world that needs them as never before.

Accrediting of Agricultural Engineering Curricula*

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In considering the subject of accrediting agricultural engineering curricula, or any other engineering curricula for that matter, it is important to keep in mind the circumstances that gave rise to the need for such accrediting.

Perhaps the most compelling of these circumstances was the general enactment, within the past two or three decades, of state laws providing for the registration or licensing of professional engineers. These laws and their requirements are intended "to safeguard life, health, and property, and to promote the public welfare." † They follow to some extent the patterns established for the licensing of doctors, lawyers, and other groups of practitioners. Because they are state laws, a separate board is required in each state having such a law. These boards are charged with the responsibility of passing upon the qualifications of applicants for engineering registration in their respective states, and therefore have to set up minimum standards of training and experience in conformity with the requirements of the registration laws. These laws differ considerably in the several states, but in most or all of them one of the alternative criteria prescribed for qualifications for registration includes "graduation in an *approved curriculum* of four years or more from a school or college *approved by the Board* as of satisfactory standing." ‡ Each engineering registration board therefore is required by law to be an accrediting agency for engineering curriculums and engineering schools whose graduates seek registration in its state.

Likewise most or all of the national, state, and local engineering societies have criteria for qualifications for membership in one or more grades which involve the matter of graduation from an *approved school or curriculum.* The United States Civil Service, other Federal, state, and local governmental agencies, and many industrial corporations and individual employers use similar criteria for employment or advancement of their employees.

To have all of these boards, societies, governmental agencies and employers proceeding independently to obtain data on and to evaluate the work done in the several curricula of the many engineering schools would be unthinkable. Obviously it was necessary for a national group of high standing to prepare an authoritative list of accredited engineering curricula upon the basis of adequate data, intelligently

*Presented at the Annual Meeting, S.P.E.E. (Agricultural Engineering), Cincinnati, Ohio, June 22–25, 1944.

†A Model Law for the Registration of Professional Engineers and Land Surveyors, etc., Section 1.

‡Ibid., Section 12 (1)a.

and impartially evaluated. No such list could be expected to be perfect because of human fallibility and border line situations, but if the work were well done the result might well be expected to be better than could be secured in any other manner.

The difficult task of accrediting engineering curricula was undertaken in 1935 by the Engineers' Council for Professional Development through its Committee on Engineering Schools and was substantially completed in 1939. Minor revisions have been made annually since that time. Much credit is due to the Council, and especially to its committee, for the workmanlike manner in which the job was done. That the result was generally satisfactory is attested by the wide acceptance of the E.C.P.D. "List of Accredited Undergraduate Curricula." It is now used generally, as published or with minor variations, by most registration boards and other groups concerned with the matter of approved curricula.

Of *eleven* curricula in agricultural engineering submitted to E.C.P.D. for evaluation up to 1943, *three* were fully accredited and *eight* were not accredited. In addition, *one* agricultural engineering option in an accredited mechanical engineering curriculum is noted in the E.C.P.D. list. If this option in mechanical engineering be considered as equivalent to an accredited agricultural engineering curriculum, the totals become *four* accredited and *eight* not accredited, or a ratio of 1 to 2. Numerous other agricultural engineering curricula have not been submitted to E.C.P.D., perhaps because the schools had no hope of securing favorable action, so the ratio of accredited to total non-accredited curricula in this field is extremely small.

This is not a situation that should be permitted to continue. It is unwholesome for both the schools and the engineering profession for a large percentage of the agricultural engineering curricula offered by the leading schools of our country to be unaccredited. It is unfair to the graduates of these curricula and to the schools offering them. It tends to bring into question the validity of the standards and criteria of the accrediting agency and to bring agricultural engineering into disrepute as a branch of the engineering profession. If the fault lies with the curricula they should be either strengthened or discontinued. If the fault lies with the accreditation criteria and standards, these should be changed. If both the curricula and the accreditation are at fault both should be remedied as promptly as possible in the interests of all concerned.

The E.C.P.D. and its committee on Engineering Schools have undertaken the accrediting of only those professional curricula in engineering, worthy of recognition as such. Obviously then agricultural engineering curricula should be accredited by E.C.P.D. only if they are truly *professional* and are really curricula in *engineering*. If they are not *engineering* curricula, but are rather curricula in *mechanized agriculture*, or if they are *sub-professional* in character, as technical institute curricula are sub-professional, they should not be accredited as professional engineering curricula, no matter how important their function may be or how high may be the standards and quality of instruction. The very name of agricultural engineering would in this case be inappropriate and should not be used.

If the agricultural engineering curriculum, courses, staff, students, and

budgets are administered solely or chiefly in the College or School or Division of Agriculture under a dean who knows little or nothing of engineering principles and of the engineering method, or if most of the departmental staff members are not themselves professional engineers, however competent they may be in other fields of endeavor, it is too much to expect that students in the curriculum will develop professional engineering competence.

If suitable mathematical, scientific, and technical prerequisites are not required for advanced courses, or if agricultural or other students without such prerequisites are admitted to the same technical classes as the professional students in agricultural engineering, then suitable standards and quality of instruction cannot be maintained, however competent the staff and administration may be, and the curriculum is not worthy of recognition as a professional curriculum in engineering.

If the curriculum covers only such engineering fundamentals as are required in the first three years of other engineering curricula and the remainder of the time is devoted to elementary agricultural courses and specialized agricultural engineering courses in which the use and application of the engineering fundamentals of the first three years are not required, but which are chiefly descriptive of equipment and techniques, the curriculum falls short of being truly a professional curriculum in engineering and should not be accredited.

Such deficiencies, actually found in many of the agricultural engineering curricula submitted to E.C.P.D for evaluation, were, I believe, the chief reasons why more were not accredited. Perhaps it may be interesting and worth while to review briefly a few reports of the E.C.P.D. inspecting committees without mentioning names of institutions or personnel. These reports were intended to reflect both the strong and the weak points of the curricula for the guidance of the regional committees and the main Committee on Engineering Schools in determining whether or not to recommend accrediting of the curricula. They were supplemented by statistical data and reports upon supporting departments, which will be omitted from this presentation.

REPORT OF INSPECTION OF —— COLLEGE RE: AGRICULTURAL ENGINEERING

1. The department was reviewed with Professor ——, Head, and Instructor ——. Mr. ——, student assistant, was met, and the administration of the department was discussed briefly with Dean —— of the Division of Agriculture, and Dean —— of the Division of Engineering.

2. The curriculum, the courses, the staff, the students, and the budget are all administered in the Division of Agriculture, and are wholly independent of the Division of Engineering. About half of the course enrollments (except in forge shop, which is taken by all engineering students) are of agricultural engineering students and the remainder are of students in other agricultural curricula. No friction appears to exist because of the administrative arrangements.

3. Both Professor —— and Mr. —— hold B.S. degrees in Agricultural Engineereing from —— College, and both are graduates of State Normal Schools. Neither has had any graduate work. Both are members of the American Society of Agricultural Engineers.

Professor —— has had several years experience as Extension Specialist in Agricultural Engineering and Director of the Rural Electrification Study in ——. He also served for several years as En-

gineering Editor of the —— *Farmer*. He is author or joint author of numerous extension circulars and Agricultural Experiment Station bulletins dealing with agricultural engineering subjects.

Mr. —— worked one year for the Ford Motor Company, —— branch, and was engaged in electrical equipment sales several years. He is joint author of three agricultural experiment station bulletins.

Mr. —— holds the degree, B.S. in Agriculture from —— College and expects to complete the requirements for his B.S. in Agricultural Engineering next year. He has had several years experience as District 4-H Club Agent in the College Extension Service.

The two shop instructors appear to be well qualified for their work. Assistant Professor —— of the Wood Shop is a graduate of —— Institute, and Instructor ——of the Forge Shop has a B.S. degree from —— College and is a certified arc welder.

4. Relatively little of the students' time is devoted to recitations, most of the courses (except shop courses) consisting of one credit hour of recitation and two credit hours of laboratory work. The laboratory work in general appears to be of a character more suited to the training of an operator or mechanic than of an engineer. Agricultural students as well as agricultural engineering students are admitted to the courses general mechanics, farm machinery, farm motors, farm structures (first course), drainage engineering, and farm and home utilities, which indicates the elementary and non-technical character of these courses. Follow up courses are provided in advanced farm motors and power, farm structures (second course), and land improvements and drainage, to which non-agricultural engineering students are not admitted, except by special permission, because the courses are too technical for such students, but even these courses do not appear to be of really high grade engineering character.

5. The curriculum includes the same courses in mathematics, inorganic chemistry, physics, economics, forge shop, engineering problems, mechanics and materials, and hydraulics that are taken by other engineering students, the same electrical machinery that is taken by civil engineering students and the same surveying that is taken by electrical and mechanical engineering students, plus a little engineering and architectural drawing, topographic surveying, quantitative analysis and machine shop. It also contains an option of heat engines or mechanical laboratory and descriptive geometry. Little else of an engineering or scientific character is required, except the departmental courses mentioned in paragraph 4 above, though 15 term hours of elective, which may or may not be in engineering or science, are provided.

6. The text books used are believed to be suitable, though too little time seems to be devoted to them, as noted in paragraph 4, above. Laboratory direction sheets examined were considered to be only fairly well prepared.

7. Enrollment is increasing fairly rapidly, having grown from 6 in 1929–30 to 28 in 1934–35, and to 41 in 1936–37. The total number of graduates to date is estimated at about 20 to 24. Graduates were reported to be well placed, largely in soil conservation work. Several were reported to be engaged in farm machinery sales work.

8. The quarters of the department are not very satisfactory but will be improved somewhat by an addition now under construction by W.P.A. labor. The equipment is mostly loaned by the manufacturers, except that used in the shop courses. The shops of the department were not examined by myself, but were reported to me by another member of our committee as being well housed and well equipped.

9. The quality of the student laboratory reports examined appeared to be only fair. Some student drawings of farm structures were good. Final examination questions examined indicated that the courses are "practical" rather than technical.

10. No graduate work is offered except that graduate students in agriculture majors may take some of the agricultural engineering courses as graduate minors. Four agricultural engineering research projects are under way.

11. Because of the facts that:

(*a*) the administration of the staff, the courses, the curriculum, and the students is in the Division of Agriculture instead of in the Division of Engineering;

(*b*) the agricultural engineering courses do not appear to contain sufficient real engineering work of appropriate quality; and

(*c*) the amount of other engineering in the curriculum is not considered sufficient to compensate for this deficiency; it is recommended that the curriculum be not accredited.

February 25, 1937.

(Signed) .....

REPORT ON INSPECTION OF —— COLLEGE RE: AGRICULTURAL ENGINEERING

1. The department was reviewed on February 17–18, 1937, by —— and ——. A conference was held with ——, head of the department; ——, Instructor; and ——, Graduate Assistant.

2. *Organization.* The curriculum in agricultural engineering is listed in the School of Engineering and its administration as a curriculum is under the supervision of the Dean of Engineering. The list of courses offered and the faculty of the department of agricultural engineering are listed both under the School of Agriculture and the School of Engineering. The administration of the department is wholly in the School of Agriculture, salaries and operating funds being allocated through that school and selection of staff and all routine matters relating to the department being handled through the Dean of Agriculture.

The members of the departmental staff also constitute the staff of the Agricultural Engineering Division of the Agricultural Experiment Station.

3. *Staff.* The staff is not impressive. The head of the department holds the B.S. in Agriculture, followed by a corresponding degree in engineering. No member of the staff has received the master's degree, though both the instructor and the graduate assistant have done some work toward that degree.

The head of the department reports membership in the American Society of Agricultural Engineers.

4. *Plan of Instruction.* Instruction appears to be largely by lecture and class discussion method. The courses offered in agricultural engineering are predominently practice courses. Of the nine offered, four include no theory, three have one hour of theory, and two each have two hours. Very few examples of student work were available for inspection, but judging from the few examples submitted the work is of a rather elementary nature.

The courses are given without prerequisites and all of them are offered as service courses to agricultural students who have been required to take no mathematics or other preparatory courses.

5. *Curriculum and Options.* The curriculum includes the mathematics through calculus and the physical sciences required of other engineering students. It includes mechanics, strength of materials, and hydraulics. In addition the courses in steam power plants, steam laboratory, machine design and electrical engineering are identical with those required for electrical engineering students. To the extent that the curriculum includes a general foundation of engineering subjects, it is satisfactory, but the courses in agricultural engineering apparently make no use of these courses, nor can they when they are open freely to students who have had none of the courses which might properly be required as prerequisites. The required courses in agriculture are those usually considered necessary in this curriculum and do not absorb an undue portion of the time.

6. *Text Books.* Course 202, now known as *Elements of Engineering*, but

soon to be called *Soil Conservation,* is the only course in the department for which a text is required. This uses a text prepared by members of the department staff. The statement was made that the courses were kept flexible to fit the needs of the students, but there was apparently a lack of any definite organization in the instruction.

7. *Enrollment.* The enrollment in the agricultural engineering curriculum has increased from 10 in 1929–30 to 26 in 1935–36, and 32 at present.

8. *Facilities.* The agricultural engineering building was erected in 1910 as a livestock judging building. The office, farm machinery laboratory and some classroom facilities are provided in it, but classes are also held in other buildings as needed, and much of the farm machinery is housed on the experimental farm. Some additional building space has been promised by W.P.A. As is frequently the case in other colleges, much of the farm machinery is loaned by manufacturers and is replaced with modern units as it becomes obsolete. Those laboratories in which the equipment has been purchased by the institution seem inadequately equipped.

9. *Quality of Student Work.* Has been discussed under paragraph 4 above.

10. *Graduate Work and Research.* Little organized graduate work was in evidence, though some was undoubtedly being conducted in connection with the Agricultural Experiment Station.

11. *Conclusions and Recommendations.* Although the basic instruction in mathematics, physics, mechanics, and general engineering subjects meet the requirements of an engineering course, the courses in agricultural engineering are inadequate. While theoretically there is joint control by the Deans of Engineering and of Agriculture, the Dean of Engineering apparently lacks sufficient authority over the department and its personnel to insure the course meeting adequate standards. For these reasons and because the courses are given without use of prerequisites and without proper rigidity of standards, as well as for other reasons discussed more fully above, it is recommended that the curriculum in agricultural engineering be not accredited.

Signed .....

REPORT OF INSPECTION OF —— UNIVERSITY RE: AGRICULTURAL ENGINEERING

1. The department was reviewed with Professor ——, Chairman. Professor —— participated in some of the discussions and laboratory inspections. Brief contacts were made with Professor —— and Dean —— of the College of Agriculture. Administration of the department, the students and the curriculum was discussed with Acting Dean —— of the College of Engineering.

2. The department is administered in the College of Agriculture. It was organized in 1914 as a service department for agricultural students, and still serves chiefly in that capacity. Nearly all of the courses are open to agricultural students, with only a few elementary prerequisites or none at all. Even the courses listed "For Advanced Undergraduates and Graduates" have no more advanced prerequisites than ten quarter credit hours of mathematics *or* physics, and certain elementary courses in agronomy, animal husbandry, and agricultural engineering. The elementary and "practical" character of the courses is evident from this lack of scientific and technical prerequisites.

Certain courses of the department are required in some of the agricultural curricula and many of the courses are suggested as acceptable electives in these curricula. In addition, a major in agricultural engineering is offered in the four year curriculum in general agriculture. Ninety-eight students are now enrolled in this major.

The curriculum submitted for appraisal was organized in 1934 and is called the "Professional Curriculum in Agricultural Engineering." It includes

five years of work, the first four of which are administered in the College of Agriculture and lead to the degree Bachelor of Science in Agriculture. The fifth year is supposed to be administered in the College of Engineering and leads to the degree Bachelor of Agricultural Engineering. Only one student has yet completed the fifth year, and he was graduated at the end of the first quarter of the present academic year. One more student is expected to graduate at the end of the present quarter, and three more at the end of the next quarter. Fifteen other students are registered in the curriculum, mostly in the first and second years. These students are handled in the same classes as those taking the agricultural engineering major of the curriculum in agriculture and other agricultural students taking the courses as required or elective work.

While the entire fifth year is supposed to be administered in the College of Engineering, as noted above, the one student that has been graduated was registered for only one quarter in the College of Engineering, and only two of the four present fifth-year-men had registered in the College of Engineering at the time of the inspection. The system is evidently not yet working as planned.

3. The staff consists of Professors ——, ——, and ——, each of whom is supposed to devote three-fourths of his time to instruction and one-fourth to research, and Professor ——, who is supposed to devote one-eighth of his time to instruction and seven-eighths to extension activities. Actually the teaching loads occupy more of the time, running from 18 to 20 clock hours for the first three men and 14 clock hours for the fourth. Some classes are much too large, including about 50 students under one professor in both recitation and laboratory work.

Professors ——, ——, and —— all hold the degree Bachelor of Science in Agriculture, and Professor —— has the degree Bachelor of Science in Agricultural Engineering. No staff member has an advanced degree. Professor —— spent three years as a student in mechanical engineering at the University of ——before changing to the agricultural curriculum.

Most of the staff members have had good industrial experience, have written extensively for publication, and have been active in the American Society of Agricultural Engineers. No membership in any other engineering, scientific, or educational society was reported.

4. Instruction follows the usual plan, except that rather more of the time appears to be devoted to class room discussion (not recitation), to inspirational and philosophical teaching, and to economic considerations, and less to technical subject matter than is usual. For the most part, no text books are used because the professors believe (1) there are no suitable texts available, (2) rapid changes in design and use of farm machinery would quickly make texts obsolete, and (3) (quoting from a report by Professor ——) "Also we do not favor texts, as such, for general use, because we are more interested in improved educational methods of guiding students to gain information by their own thought process in lieu of giving it to them for memorization." Extensive use is made of mimeographed instruction sheets and home problems, which seem to be fairly well prepared for service courses for agricultural students.

5. The curriculum includes as required work all of the courses of the common freshman year for engineering students, except qualitative analysis. It also includes ten of the same fifteen quarter credit hours of calculus, and the same physics, statics, strength of materials, dynamics, English and economics required of mechanical engineering students. No mechanisms, hydraulics, thermodynamics, heat-power engineering, or electrical engineering, no civil engineering except 3 to 5 hours of surveying, and no industrial engineering except 3 hours of machine shop work, are listed as required courses, though such courses are available as elec-

tives, and 50 to 60 hours of engineering electives are to be taken.

All the fifth-year work except 3 quarter credit hours is elective, 30 hours being listed as engineering elective, 3 to 15 hours as agricultural engineering special problems, and the remainder as open elective. Of the fourth-year work 20 to 30 hours are listed as engineering elective, and 5 to 15 hours as agricultural elective. Thus about three-fourths of the last two years' work are elective, subject to the approval of the Chairman of the Department. Groups of engineering electives are suggested for students wishing to specialize in (1) land maintenance and improvement, (2) farm structures, (3) farm power and machinery, or (4) rural electrification.

While 50 to 60 hours of engineering elective are scheduled in the curriculum, only 33 hours of engineering elective were reported as actually having been taken by the student graduated last fall, and 37 hours by the student who is expected to graduate at the end of the present semester. Neither of these students followed any one of the groups listed above.

6. Such texts as are used are considered suitable, but, as noted under (4) above, few are used. Laboratory direction sheets are considered fairly satisfactory.

7. For enrollment data see (2) above.

8. The building and equipment are considered fully adequate—much better than are usually found. Housekeeping is good. A good agricultural engineering library is housed in the building. Maintenance funds are low at present, but this condition is considered temporary.

9. Little student work was available for inspection. That examined was considered of fair quality of its kind but reflected the lack of real engineering training.

10. The staff is doing a fair amount of creditable research and numerous publications have been issued based wholly or in part upon the research work done in the past.

11. The principal unsatisfactory situations noted in agricultural engineering may be summarized as follows:

(*a*) The curriculum is comparatively new and the policies and procedures are not well established.

(*b*) Insufficient administrative authority and responsibility are vested in the College of Engineering.

(*c*) Only one of the four staff members has an engineering degree and no staff member has an advanced degree.

(*d*) The courses are too elementary and non-technical in character, the prerequisites being inadequate, and engineering and non-engineering students being handled in the same classes.

(*e*) Insufficient basic engineering instruction is included in the required courses of the curriculum.

(*f*) The number of elective hours is so great that the curriculum is highly indefinite.

Because of these conditions it is recommended that the curriculum be not accredited.

March 22, 1937

(Signed) .....

Would you have recommended any of these three curricula for accrediting? Do you believe that students in these curricula could be expected to receive adequate training for the practice of professional engineering as defined in the Model Registration Law? That definition is as follows: "The practice of professional engineering within the meaning and intent of this Act includes any professional service, such as consultation, investigation, evaluation, planning, design, or operation, in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects, wherein the public welfare, or the safeguarding of life, health, or property is concerned or involved, when

such professional service requires the application of engineering principles and data." Would engineering registration boards, appointed to administer laws designed "to safeguard life, health, and property, and to promote the public welfare," be justified in classing these three and other similar curricula as approved curricula in engineering? I think not.

What should agricultural engineering educators and administrators do about this situation? I believe that now, while enrollments are at a low ebb, all agricultural engineering curricula, courses, departmental organizations and staffs, as well as all these same items in all other fields of education, should undergo careful analysis and thorough study. Such changes should be made as may be found necessary to accomplish most surely and efficiently the desired objectives.

Service courses for agricultural students should undoubtedly continue to be given by the department of agricultural engineering. These courses should be planned and taught in close coöperation with the agricultural faculty and should be designed to be of the greatest value to the *agricultural* students they serve.

Perhaps an option in mechanized agriculture should be offered in the agricultural curriculum and administered under the direction of the dean of agriculture. This should not be titled as a curriculum in agricultural engineering or an option in agricultural engineering.

In addition, I believe there is real need, in a moderate number of institutions, for a truly professional curriculum in agricultural engineering of such character as to fully merit accreditation by E.C.P.D. My idea of these curricula is as follows:

1. The curricula should carry about the same content in physics, chemistry, mathematics, mechanics, and perhaps thermodynamics as the curricula in other major branches of engineering.
2. The content of agricultural subjects should not exceed about 12 or 15 semester credits.
3. The recitation, shop and laboratory courses in agricultural engineering for professional agricultural engineering students should require suitable prerequisites and be taught separately from those courses open to agricultural students without these prerequisites. All shop or laboratory courses should be organized to teach principles rather than mere practice or manual skill.
4. The advanced work in power machinery, land reclamation and structures should be organized so as to include a considerable amount of application of the principles of the physical sciences, mechanics, machine design, thermodynamics, and the like, to the machines, structures, and operations peculiar to the agricultural engineering field and the manufacture of materials and equipment used in the agricultural industry.
5. The curriculum, the staff, and the students in agricultural engineering should be administered by the engineering dean. An alternative, but less desirable, method might be administration by a committee with the engineering dean as chairman. In any case, close coöperation should be maintained between the department of agricultural engineering and the several agricultural and engineering departments, not only in instructional matters but also in research and extension activities.

Any agricultural engineering curriculum so organized and administered, with a competent staff, an adequate budget, and high standards of instruction and accomplishment would, I believe, readily be accredited by E.C.P.D. Graduates of such a curriculum should find ready acceptance into the engineering profession and they should be well prepared to render very important services which are greatly needed by agriculture.

Machine Design Clearinghouse Carries On

At the annual S.P.E.E. meeting the Machine Design Committee of the Mechanical Engineering Division voted to resume its Machine Design Clearinghouse service for those members interested in this branch of instruction.

All S.P.E.E. members concerned with design automatically become members of the Machine Design Clearinghouse and are eligible to subscribe to the Clearinghouse Bulletin which will be published monthly. Subscriptions *accompanied by the initial fee of one dollar* should be addressed to the new editor, Professor H. A. Bolz, at the address shown below. Further assessments will be made only when the operating fund nears exhaustion. It is expected that such assessments will average less than one dollar per year.

The Machine Design Clearinghouse Bulletin will present:

1. Papers, discussions, comments on machine design instruction and related subjects.
2. Discussions of current design developments, methods, etc.
3. Machine design problems and classroom design projects.
4. Lists of available catalogs, handbooks, movies, commercial samples, models, etc.
5. Bibliographies on design subjects, announcements of texts and problem books by members.
6. An informal employment service for subscribers.

In order that this service may be of real and immediate value, it is essential that interested members

1. Send in subscriptions *now* and
2. Begin furnishing the editor with material and suggestions under the six headings listed above.

This clearinghouse, it may be well to emphasize, is intended to be not an outlet of expression for one or two individuals but a medium for the exchange of ideas and information by all members. It must receive wide support if it is to accomplish its purpose.

H. A. Bolz, *Editor,*
The Machine Design Clearinghouse,
Purdue University,
Lafayette, Indiana.

New Members

ANDERSON, FRANK A., Assistant Professor of Chemistry and Chemical Engineering, University of Mississippi, University, Miss. R. M. Boarts, J. L. Oglesby.

AUTEN, R. L., Manager, Engineering Personnel Bureau, Curtiss-Wright Corp., 663 Main Ave., Passaic, N. J. Glenn Murphy, H. M. Barlow.

LEVY, GEORGE F., Instructor in Electrical Engineering, Illinois Institute of Technology, Chicago, Ill. E. H. Schulz, R. C. Kintner.

MALLETT, FRANK M., Production Design Engineer, Curtiss-Wright Corp., 53 Arcadia Ave., Columbus 2, Ohio. Warren Bruner, Fred Ocvirk.

MOSSMAN, THIRSA A., Assistant Professor of Mathematics, Kansas State College, Manhattan, Kansas. R. L. Kloeffler, R. M. Kerchner.

MURPHY, JOHN W., Engineer in charge of engineering training, Radio Div., Western Electric Co., Kearny, N. J. E. L. Devor, T. A. Schneider.

NICHOLSON, JOHN B., Librarian, Fenn College, Cleveland, Ohio. W. H. Hyde, M. B. Robinson.

SELLNER, E. P., Assistant Professor of Applied Mechanics, University of Kansas, Lawrence, Kansas. F. L. Brown, E. E. Ambrosius.

STURM, ROLLAND G., Professor of Engineering Mechanics and Research Professor of Materials, Purdue University, Lafayette, Ind. Seibert Fairman, A. P. Poorman.

TOWN, GEORGE R., Manager of Engineering and Research, Stromberg-Carlson Co., Rochester, N. Y. L. C. Holmes, M. J. Larson.

ZAREM, A. MORDECAI, Research and Development Engineer, Allis Chalmers Mfg. Co., Milwaukee, Wis. H. T. Heald, L. E. Grinter.

GLEASON, MABEL R., Librarian, Stromberg-Carlson Co., Rochester, N. Y. M. J. Larsen, L. C. Holmes.

Sections and Branches

At a meeting of the **Michigan College of Mining and Technology** Branch of the S. P. E. E. on May 23, 1944, a panel discussion was held relative to aptitude tests, sequence of courses, learning processes, selection and motivation, and other topics of interest to both secondary school teachers and college teachers.

Representing M. C. M. and T. were members C. H. Knaebel, R. F. Makens, and S. R. Price. Representing the secondary schools of the Copper Country were G. G. Graham, principal, Lake Linden high school; O. M. Vedder, superintendent, Hancock schools; and I. S. Edwards, superintendent, Houghton schools.

After the panel, Dean James Fisher presided over a spirited general discussion.

Many members and guests were of the opinion that this type of meeting was not only entertaining, but highly instructive.

On Monday, June 5, 1944, a regular meeting was held, mainly for the purpose of electing officers for the next college year.

The current officers were reëlected by unanimous vote; the officers for the new year, therefore, are: chairman, L. A. Rose; vice-chairman, F. L. Partlo; secretary, W. A. Longacre.

It was decided that meetings of the branch during the summer session should be called at the discretion of the officers and the chairman of the program committee, acting as a committee.

Chairman Rose appointed C. H. Knaebel and S. R. Price as a committee to investigate the placing in the hands of interested high school students of reading material pertaining to engineering and engineering education.

W. A. LONGACRE,
Secretary.

Following is a list of the activities of the **Michigan State College** Branch of S. P. E. E. for the school year 1943–44. You may make any use of this material which you think proper.

The Branch opened business in the Fall with the following officers:

C. L. Allen, President
L. C. Price, Vice-President
C. L. Brattin, Secretary
M. G. Larian, Treasurer

The above, with O. W. Fairbanks, past president, made up the executive committee. This committee held five meetings during the year.

We have held two general meetings, one on February 25, at which Professor F. W. Reeves of the University of Chicago discussed "Post War Engineering Education at M. S. C." Prof. Reeves was instrumental in establishing at our school a new system whereby *every student* entering the institution is required to take five to seven broad area or cultural courses, each to be pursued for one year. This means engineers as well as every other specialized group. Much has been said at S. P. E. E. meetings about the narrow education which engineers get. Michigan State College is committed to the role of pioneer and beginning with next Fall Term the engineers will be-

gin to get this broader, cultural training as well as the more specialized engineering work.

Our second general meeting was held on the evening of May 31st. This was a dinner meeting and the wives were welcomed. The speaker of the evening was Dr. T. H. Osgood, Head of our Department of Physics. He spoke, in rather humorous fashion, of his secondary school education in Scotland and related experiences while obtaining a degree at Cambridge University in England.

Our Branch is at present sponsoring six radio programs which go out over our college radio station WKAR. Dean Dirks lead off with a general discussion of Engineering Education last Thursday, May 25th. He will be followed on each succeeding Thursday by a representative from one of the five departments in the Engineering Division, namely: Mechanical, Civil, Electrical, Chemical and Metallurgical, and Drawing and Design.

Through our activities, discussions, etc., we hope we have contributed in some small way toward the advancement of engineering education.

C. L. BRATTIN,
Secretary.

The new officers of **The Pennsylvania State College** Branch of S.P. E.E. are as follows:

Chairman, L. A. Doggett
Vice Chairman, J. S. Doolittle
Secretary, R. H. Carey

Pratt Institute.—As of July 1944, Pratt Institute announces the appointment of N. S. Hibshman as director of the School of Science and Technology. Professor Hibshman was head of the electrical engineering department of New York University. Professor Hibshman succeeds Director Arthur L. Cook who has attained the Institute's retirement age.

American Institute of Electrical Engineers.—Charles A. Powel, Manager, Headquarters Engineering Departments, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., was elected president of the American Institute of Electrical Engineers for the year beginning August 1, 1944; Vice-Presidents R. Henry, Buffalo, N. Y.; J. F. Fairman, New York, N. Y.; M. S. Coover, Ames, Iowa; R. W. Warner, Austin, Texas; C. B. Carpenter, Portland, Ore.—Directors P. L. Alger, Schenectady, N. Y.; M. J. McHenry, Toronto, Canada; D. A. Quarles, New York, N. Y.—National Treasurer W. I. Slichter, New York, N. Y. (re-elected).

H. H. HENLINE,
National Secretary.